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CONTENTS

CO-OPERATIVE SEED TREATMENT TRIALS -- 1960 [1]

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Abstract

Twenty seed-treatment products, 10 powders and 10 liquids, were tested in experimental plots against bunt of wheat (mixed Tilletia foetida (Wallr.) Liro and T. caries (DC.) Tul.), oat smut (mixed Ustilago avenae (Pers.) Rostr. and U. kolleri Wille), covered smut of barley (U. hordei (Pers.) Lagerh.), and seed rot of flax promoted by mechanical injury to the seed. The products were also tested under greenhouse conditions for their phytotoxicity to stored seed, and some of the commercial products were tested further at more than one dosage to determine whether the rate now used could be safely reduced. The results obtained showed that all but one treatment controlled bunt of wheat, five treatments controlled smut of oats, eight treatments controlled smut of barley, and six treatments controlled seed rot of flax. A few products were found to be phytotoxic to wheat but not to oats or barley.

Materials and Methods

The seed-treatment products tested in 1960 were:

Aabiton-- A liquid containing 1.5% mercury as methyl mercury benzoate. Obtained from Leytosan (Canada) Ltd., Winnipeg, Manitoba.

Aagrunol VBS 20 -- A liquid containing 2.0% mercury as methyl mercury benzoate. Obtained from N. V. Aagrunol Chemical Works, Groningen, Holland.

Aagrunol VTF 100 RCE -- A liquid containing 34.0% heptachlor and 1.0% mercury as methyl mercury benzoate. Obtained from N.V. Aagrunol Chemical Works, Groningen, Holland.

Ceresan M -- A powder containing 3.2% mercury as ethyl mercury-p-toluene sulfonanilide. Obtained from I. E. du Pont de Nemours, Wilmington, Delaware.

Dual Purpose Bunt-No-More -- A powder containing 40.0% heptachlor and 13.0% hexachlorobenzene. Obtained from Green Cross Products, Montreal, Quebec.

Gallodual -- A liquid containing 30.8% aldrin and 1.43% mercury as phenyl mercury acetate. Obtained from Gallowhur Chemicals Canada Ltd., Lachine, Quebec.

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[1] Contribution No. 77 from the Canada Department of Agriculture Research Station, Winnipeg, Manitoba.

[2] Principal Plant Pathologist and Associate Plant Pathologist, respectively, Plant Pathology Laboratory.

Liqui -San Metasol -- A liquid containing 1.4% mercury as methyl mercury 8-hydroxyquinolinate. Obtained from Green Cross Products, Montreal, Quebec.

Liqui-San Metasol Concentrate -- A liquid containing 4.2% mercury as methyl 8-hydroxyquinolinate. Obtained from Green Cross Products, Montreal, Quebec.

Nuodex PMA-5 -- A powder containing 5.0% mercury as phenyl mercury acetate. Obtained from Nuodex Products of Canada Ltd., Toronto, Ontario.

Nuodex PMA-4.2 -- A liquid containing 4.2% mercury as phenyl mercury acetate. Obtained from Nuodex Products of Canada Ltd., Toronto, Ontario.

Omadine No. 2129 -- A powder containing a derivate of pyridinethione ("Omadine thiourea"). Obtained from Olin Mathieson Chemical Corporation, Port Jefferson Station, New York.

Omadine No. 1563 -- A powder containing a zinc salt of pyridinethione. Obtained from Olin Mathieson Chemical Corporation, Port Jefferson Station, New York.

Ortho LM Seed Protectant (dry) -- A powder containing 3.2% mercury as methyl mercury 8-hydroxyquinolinate. Obtained from California Spray-Chemical Corporation, Maryland Heights, Missouri.

Ortho Seed Guard Wettable -- A powder containing 17.0% lindane and 50.0% captan. Obtained from Ortho Agricultural Chemicals Ltd., Vancouver, British Columbia.

Pandrinox -- A liquid containing 24.4% heptachlor and 0.5% mercury as methyl mercury dicyandiamide. Obtained from Morton Chemical Company, Woodstock, Illinois.

Panogen 15 -- A liquid containing 1.5% mercury as methyl mercury dicyandiamide. Obtained from Morton Chemical Company, Woodstock, Illinois.

Panogen 42 -- A liquid containing 4.2% mercury as methyl mercury dicyandiamide. Obtained from Morton Chemical Company, Woodstock, Illinois.

Puradrin XL -- A powder containing 30.0% lindane and 1.85% mercury as phenyl mercury formamide. Obtained from Gallowhur Chemicals Canada Ltd., Lachine, Quebec.

Puraseed -- A powder containing 3.85% mercury as phenyl mercury formamide. Obtained from Gallowhur Chemicals Canada Ltd., Lachine, Quebec.

Trisanide -- A powder containing 50.0% auramine dimethyl dithiocarbamate and 25.0% hexachlorobenzene. Obtained from Niagara Brand Chemicals, Burlington, Ontario.

The seed used for 1960 trials was as follows:

Wheat bunt trials -- Wheat variety Red Bobs. The seed was artificially contaminated (1:200, by weight) with mixed dry spores of *Tilletia foetida* and *T. caries*.

Oat smut trials -- Oat variety Vanguard. A light natural inoculum on seed supplemented by mixed spores of Ustilago avenae and U. kolleri. The extra inoculum (1:600) was applied by the partial vacuum method and the inoculated seed was dried at room temperature for a week before it was treated.

Barley smut trials -- Barley variety Herta. The light natural inoculum was supplemented with spores (1:600) of Ustilago hordei applied by the partial vacuum method. The seed was then dried for a week at room temperature.

Flax seed-rot trials -- Flax variety Redwood. About 50% of the seeds were cracked during threshing.

The seed was treated by mixing predetermined quantities of fungicide and seed in closed half-gallon glass jars shaken vigorously 200 times by means of a specially built laboratory device. This gave an excellent mix with fungicides in powder form and good mix with liquids. The treated seed was left in the jars for 24 hours, after which four 200-seed lots for each experiment were withdrawn from each jar for sowing in the field and the two 100-seed lots for sowing in the greenhouse. The jars with the treated seed were then set aside for about 4 1/2 months after which two other 100-seed lots were withdrawn for a second sowing in the greenhouse. The field sowings provided information concerning the effectiveness of the different fungicides against smut in wheat, oats, and barley, and against seed rot in flax, while the sowings in the greenhouse yielded data concerning the phytotoxicity of each product in the test.

Experimental Results

The data obtained from the field plots in 1960 are summarized in Table 1. This table shows that all of the treatments tested, except Ortho LM Seed Protectant (dry) and Omadine No. 2129, gave a good control of bunt in wheat; that Ceresan M, Nuodex PMA-5, Aagrunol VTF 100 RCE and Pandrinox gave good control of the oat smuts; and that Ceresan M, Puradrin XL, Aagrunol VTF 100 RCE, Gallodual, Liqui-san, Pandrinox, and Panogen 15 gave good control of barley smut. Several of the materials tested controlled seed rot of flax. Table 1 shows also that some of the products in the trials were used at too low a dosage, resulting in inadequate control of disease.

Tests in the greenhouse of stored treated seed showed that Nuodex PMA-5, Puradrin XL, and Aagrunol VTF 100 RCE could be, under some conditions at least, severely phytotoxic to wheat. Ceresan M, Gallodual, and Pandrinox under the same conditions caused only moderate injury. Oats and barley showed only light injury or none at all.

Table 1. Co-op seed-treatment trials - 1960. Summary of results.[a]

Treatment	Dose (oz./bu.)[b]				Percentage smut			Percentage germination
	Wheat	Oats	Barley	Flax	Wheat	Oats	Barley	Flax
Control (dry untreated seed)	0.00	0.00	0.00	0.00	22.3	13.0	6.4	41.9
Ceresan M (powder)	0.50	0.00	0.50	1.50	0.0	2.2	1.1	55.7
*Dual Purpose Bunt-No-More (powder)	2.00	1.40	1.40	5.00	0.1	12.1	6.0	36.0
Nuodex PMA-5 (powder)	1.30	1.30	1.30	1.30	0.2	2.2	0.5	50.6
Omadine No. 2129 (powder)	0.50	0.50	0.50	1.50	1.2	11.5	4.9	43.7
" No. 1563 (powder)	1.50	1.50	1.50	1.50	0.3	7.8	2.6	51.8
Ortho LM Seed Protectant (powder)	0.50	0.50	0.50	1.50	8.0	9.8	5.9	42.3
Ortho Seed Guard Wettable (powder)	1.50	1.50	1.50	3.00	1.2	8.5	3.6	60.1
*Puradrin XL (powder)	2.00	1.40	1.40	5.00	0.3	2.7	1.3	48.5
Puraseed (powder)	0.50	0.50	0.50	1.50	1.0	4.8	2.2	51.5
Trisanide (powder)	2.00	1.13	1.60	1.80	0.1	8.6	3.9	39.4
Aabiton (liquid)	0.75	0.75	0.75	1.50	0.1	5.3	2.9	50.7
Aagrunol VBS 20 (liquid)	0.75	0.75	0.75	1.50	0.1	3.7	2.0	57.3
" VTF 100 RCE (liquid)	2.00	2.00	2.00	2.00	0.1	1.2	0.1	55.6
Gallodual (liquid)	2.00	2.00	2.00	6.00	1.2	3.9	1.2	40.6
Liqui-san (liquid)	0.75	0.75	0.75	1.50	0.1	2.8	1.6	49.5
" concentrate (liquid)[c]	0.20	0.20	0.20	0.60	0.2	3.8	3.7	49.2
" " "	0.25	0.25	0.25	0.75	0.1	3.6	2.7	50.5
Nuodex PMA-42 (liquid)	0.75	0.75	0.75	1.50	0.1	6.4	1.8	51.9
Pandrinox (liquid)	2.12	2.12	2.12	5.00	0.3	2.2	1.6	46.3
" "	3.75	3.75	3.75	6.00	0.1	1.2	0.2	45.7
Panogen 15 (liquid)	0.50	0.50	0.50	1.50	0.1	4.8	3.0	60.9
" "	0.75	0.75	0.75	2.25	0.2	2.6	1.4	60.2
Panogen 42 (liquid)[c]	0.20	0.20	0.20	0.60	0.2	4.1	2.3	52.4
" "	0.25	0.25	0.25	0.75	0.1	2.9	1.8	55.0
Significant difference (5%)					2.9	1.2	0.8	3.3

[a] Means of 6 Stations for wheat, 10 Stations for oats, 11 Stations for barley, and 9 Stations for flax.

[b] For treatments marked by asterisk (*) the dosage was based on the following seeding rates: 1.25 bu./acre for wheat, 1.75 bu./acre for oats and barley, and 0.50 bu./acre for flax.

[c] Diluted with water before use.

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SEED TREATMENT SURVEY IN THE PRAIRIE PROVINCES - 1960

F. J. Greaney [1]

Following the procedure established in 1959, individual elevator Agents were asked, through a questionnaire type survey form, to estimate, for the district served by their elevator, the percentage of the total seeded acreage of wheat, oats, barley and flax that was planted with treated seed. The results, presented in Table 2, are based on the replies received from some 1, 100 elevator Agents. The survey data are summarized by provinces and for the Prairie Provinces as a unit. In the case of Saskatchewan and Alberta the data are also summarized by crop reporting districts. It is felt that the data presented here give a fairly reliable indication of the extent to which seed treatment was practiced by farmers in western Canada in 1960.

The 1960 survey results indicate that the usage of seed treatment in each of the Prairie Provinces this year was practically the same as in 1959. The figures for the two years are given in Table 1.

Table 1. Percentage of Acreage Planted with Treated Seed.

	Wheat		Oats		Barley		Flax	
Province	1959	1960	1959	1960	1959	1960	1959	1960
Manitoba	47	48	26	25	42	42	40	41
Saskatchewan	60	62	61	60	75	76	63	56
Alberta	86	86	81	81	91	88	81	76
Prairie Provinces	68	69	65	64	78	77	66	60

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Director, Line Elevators Farm Service, Winnipeg, Man.

Table 2. Results of 1960 Seed Treatment Survey.

Province and Crop Reporting District	Percentage of Total Seeded Acreage Planted with Treated Seed1/			
	Wheat	Oats	Barley	Flax
MANITOBA				
Average**	47.8 (95)	24.5 (92)	41.8 (95)	40.8 (90)
SASKATCHEWAN				
1A	49.6	22.5	57.9	33.4
1B	48.1*	49.6*	75.0*	52.8*
2A	65.6	58.2	72.4	53.1
2B	60.4	50.3	74.3	51.7
3AN	60.9	54.3	78.1	50.5
3AS	68.8	64.3	78.0	53.8
3BN	74.3	69.4	81.4	63.3
3BS	65.8	67.6	73.2	57.4
4A	65.8	62.9	77.5	57.2*
4B	81.7	77.9	87.3	67.7
5A	25.5	31.1	47.6	29.7
5B	32.7	40.5	63.5	45.1
6A	63.9	61.7	78.6	60.5
6B	76.4	68.8	85.5	60.9
7A	84.3	80.0	93.3	78.4
7B	83.5	81.6	94.0	66.1
8A	44.0	49.0	61.7	29.2
8B	44.5	71.4	90.7	46.6
9A	64.6	69.3	77.1	61.7*
9B	45.0	60.2	70.7	46.3*
Average**	61.5 (628)	60.4 (611)	76.3 (624)	56.1 (497)
ALBERTA				
1	86.6	79.2	84.8	74.3
2	91.6	85.1	92.4	82.4
3	90.5	82.1	89.3	80.7
4	79.7	81.8	87.1	69.1
5	74.8	66.7	76.1	61.3*
6	84.8	77.9	86.1	42.1*
7	91.2	84.5	91.3	67.6
Average**	85.9 (371)	81.1 (367)	88.0 (372)	76.2 (228)
PRAIRIE PROVINCES				
Average**	68.6 (1094)	64.4 (1070)	77.3 (1091)	60.1 (814)

*Based on less than 10 individual reports.

**Weighted.

1/ The figures in brackets represent the number of individual reports used to determine the percentage acreage figures.

SCREENING OF POTATO FUNGICIDES IN 1960

L. C. Callbeck[1]

In 1960, fourteen fungicides for potato late blight, *Phytophthora infestans* (Mont.) de Bary were included in the Screening Test conducted at Charlottetown. These fungicides were:

1. Blitane -- A mixture of copper oxychloride (37%) and zineb (16%).
   Source: Fisons Pest Control Limited, England.
   Concentration: 2.5 pounds per 80 Imperial gallons.

2. Blitox -- Copper oxychloride, 20% copper.
   Source: Fisons Pest Control Limited, England.
   Concentration: 4 pounds-80 gal.

3. Bordeaux, 8-4-80. Included annually as a standard treatment.

4. Colloidox -- A colloidal copper product containing 20% copper.
   Source: Metallurgical Chemists Limited, England.
   Concentration: 4 pounds-80 gal.

5. Cuprosan -- Copper oxychloride (37.5%) and zineb (15%).
   Source: Pechinery-Progil, France.
   Concentration: 2.5 pounds-80 gal.

6. Delan -- 2,3-dinitrilo-1,4, dithiaanthraquinone.
   Source: E. Merk, Germany.
   Concentration: 2 pounds-80 gal.

7. Dithane M-22 -- Manganese ethylene bisdithiocarbamate.
   Source: Rohm and Haas Company of Canada, Limited.
   Concentration: 1.5 pounds-80 gal.

8. Gorsatox 70 -- 1-chloro-2,4-dinitronaphthalene.
   Source: Fisons Pest Control Limited, England.
   Concentration: 1.5 pounds-80 gal.

9. LO-1499 -- Ammonium ethylene bisdithiocarbamate.
   Source: Rohm and Haas Company of Canada, Limited.
   Concentration: 1 quart + 1 pound zinc sulphate-80 gal.

10. Manzate -- Manganese ethylene bisdithiocarbamate.
    Source: DuPont of Canada, Limited.
    Concentration: 1.5 pounds-80 gal.

11. Manzate + Thylate -- Maneb + thiram.
    Source: DuPont of Canada, Limited.
    Concentration: 1 pound + 1 pound-80 gal.

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12. Miller 658 -- Copper-zinc-chromate.
    Source: Miller Chemical and Fertilizer Corporation, U.S.A.
    Concentration: 1.5 pounds-80 gals.

13. N-2038 -- Confidential.
    Source: Rohm and Haas Company of Canada, Limited.
    Concentration: 1.5 pounds-80 gal.

14. X-9 + additive -- Confidential.
    Source: Rohm and Haas Company of Canada, Limited.
    Concentration: 1.5 pounds + 120 cc.-80 gal.

The plots were planted on May 31, the Green Mountain seed pieces being counted to assure the same number in each row. Each plot was 4 rows wide by 50 feet long, and 15 plots (one for each fungicide and an unsprayed control) were set out in each of 5 ranges. Single rows of potatoes were used as borders and buffers. All data were taken from the two center rows.

The sprays were applied by an experimental tractor-sprayer unit on which the nozzles were so arranged that each row received a 4-nozzle application. A constant pressure of 375 pounds per square inch was maintained. All rows were sprayed with DDT on June 22 and with Malathion on August 15. The fungicides were applied on July 15, 26, August 4, 15, 28, September 8. On September 20 the test was completed by spraying all plants with a solution of sodium arsenite.

It was an unusually dry season, the rainfall for the July-September period being only 6.43 inches made up of 2.13 inches on July, 0.91 inches in August, and 3.39 inches in September. Of this amount, only 2.31 inches fell between July 15 and September 8, the dates of the first and last applications of the fungicides.

In an attempt to build up late blight infection, water suspenions of spores were disseminated frequently over the plants in the unsprayed buffer and border rows. The first dissemination was made on July 20, and by July 28 from one to three lesions were found in a few of these rows. Repeated attempts, many of them in evenings, were made through August and into September, and in the latter part of this period the spores were sprinkled over the sprayed plots as well. By September 20, when the test was terminated by the application of top killer, only 15 per cent defoliation had occurred in the unsprayed check plots. Under these conditions it was impossible to evaluate the fungicides with respect to control of disease on the foliage.

Some damage, however, was inflicted by spraying the plants under the hot, dry conditions that prevailed. The blight lesions being generally dry, it was almost impossible to distinguish them from spray injuries, and the percentage defoliation figures given in Table 1 are therefore meant to include all types, whether disease, phytotoxic effects, or mechanical injury. The figures in Table 1 are the approximate mean defoliations for the five plots of each treatment. It will be observed that the defoliations were highest in plots treated with copper fungicides.

Table 1. Percentage of defoliation, September 20.

Treatment		Treatment	
Miller 658	4	Gorsatox	7
LO-1499	5	Cuprosan	7
Manzate + Thylate	5	Blitane	8
X-9 + additive	5	Blitox	9
Delan	6	Bordeaux	10
Dithane M-22	6	Colloidox	10
Manzate	6	Check	15
N-2038	6		

Little late blight tuber rot was found in the crop, the unsprayed plots having only 2.9 per cent loss from this cause, and a mere trace occurring in five of the treatments. The tuber rot was probably induced by rains of 0.06, 0.37, 0.01, 0.36, 0.50 inches that fell on September 9 to 13, and a heavy rain of 1.20 inches on September 20.

Yield data are presented in Table 2 in which the treatments are arranged in descending order of yields of No. 1 tubers. It is noted that all the copper fungicides appear at the bottom of the table.

Table 2. Effect of treatments on yield and rot.

Treatment	Total bu/ac	Smalls bu/ac	Rot bu/ac	No. 1 bu/ac	% Rot
Manzate + Thylate	433.0	36.1		396.9	
Manzate	427.4	33.9	0.1	393.4	trace
Miller 658	420.1	32.1	0.3	387.7	trace
LO-1499	415.8	30.4		385.4	
X-9 + additive	421.1	36.1		385.0	
Dithane M-22	418.0	37.4		380.6	
Delan	407.0	27.7		379.3	
N-2038	406.4	34.8	0.2	371.4	trace
Gorsatox	402.1	33.4		368.7	
Cuprosan	406.6	39.6		367.0	
Blitane	403.0	38.7		364.3	
Blitox	397.9	35.6	0.2	362.1	trace
Bordeaux	391.2	34.8		356.4	
Colloidox	382.1	35.2	0.2	346.7	trace
Check	392.3	38.7	11.7	341.9	2.9

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FLAX DISEASES IN SASKATCHEWAN IN 1960

T. C. Vanterpool[1]

The estimated flax acreage in Saskatchewan in 1960 was 1,400,000 with an average yield of 8.8 bushels per acre. Moist conditions early in the spring gave uniform seedling stands and this, in conjunction with a cool June got most flax fields away to a good start. The drought and high temperature which prevailed for the remainder of the summer produced short plants which were unusually free of all the late-summer diseases.

One of the most severe outbreaks of Rhizoctonia seedling blight on record occurred over widely scattered areas of the province in 1960. In many fields the blighting continued until late June or early July and developed into a root-rot complex on the larger plants. Severe damage was reported and specimens were received from the Experimental Farms at Swift Current, Indian Head and Melfort. Blight was reported to run as high as 10-25% in some fields at Swift Current. In a large area southwest of Saskatoon, centering around Delisle, blight ranged from a trace to 1 per cent in flax fields following summer fallow. In two instances herbicidal damage appeared to intensify the late-occurring damage. No differences in varietal susceptibility to the disease could be detected.

Early isolations from blighted seedlings yielded _Rhizoctonia praticola_ almost exclusively. As the season advanced, _R. praticola_, _Pythium ultimum_ and _Fusarium_ spp. were obtained in about equal numbers. _Rhizoctonia solani_ was rarely isolated and then the strains encountered were only weakly pathogenic.

It should be strongly emphasized that the species of _Rhizoctonia_ mainly responsible for seedling blight of flax in Saskatchewan is _R. praticola_ (Kotila) Flentje = _Pellicularia praticola_ (Pat.) Flentje and not _R. solani_ Kühn = _Pellicularia filamentosa_ (Pat.) Rogers. Preliminary evidence indicates that the same is true in Manitoba.

Only two authentic reports of heat canker were received. The good growing conditions and uniform stands of seedlings resulted in the bases of the plants being well protected during the bright, dry, hot weather in July. One instance of wind damage, sometimes confused with heat canker, was recorded. Boll blight or sterility was unusually common in 1960. Early season weather conditions encouraged the formation of large numbers of flowers and young bolls, many of which failed to develop following the onset of prolonged hot and dry conditions in July and August. A scorching or burning of the upper one-third of the plant as a response to drought and heat occurred occasionally in areas where the layer of top soil was thin.

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[1] Professor, Department of Biology, University of Saskatchewan, Saskatoon, Sask.

A white leaf spot and stunting, resembling the symptoms of zinc deficiency, were found in a field at Conquest. The condition appeared in plants in areas of the field where straw piles had been burned a number of years previously. In the burned areas the soil was low in organic matter and the pH was higher than that of normal soil. So far as is known, no conspicuous symptoms have appeared on cereals grown in the same field.

Traces only of aster yellows were found late in the season in the northern parkbelt area. The disease was virtually absent from flax in the open prairie. Alternaria blight (Alternaria linocola) was occasionally found in trace amounts in the parkbelt. Specimens showing injury from 2,4-D were received from Kincaid and Kindersley. Rust, stembreak and browning, and pasmo were not seen in 1960.

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RAPE DISEASES IN SASKATCHEWAN IN 1960

T. C. Vanterpool[1]

The estimated rape acreage in Saskatchewan in 1960 was 550,000 with an average yield of 727 pounds per acre. Fungus diseases were again negligible in the dark brown and brown soil zones, but continued to be of slight, but increasing, importance in the black soils of the parkbelt. Heat and drought during middle and late summer were responsible for lower yields than in 1959.

White rust (Albugo cruciferarum) was again common in areas in the parkbelt where it has become established. Its incidence, however, is being kept at the trace to slight level where rotation is practiced. The disease was again most prevalent in the Melfort-Nipawin and Meadow Lake areas. The conidial stage was more conspicuous than usual in 1960. The development of Alternaria on the Albugo hypertrophies was not as conspicuous at harvest time as in previous years, probably due to the dry conditions prevailing in August and September. Conidiophores of the downy mildew fungus (Peronospora parasitica), however, developed on the hypertrophies caused by Albugo in a few fields at Meadow Lake and in two fields at Kinistino. This disease complex was not observed in 1959. The white rust fungus was collected on cruciferous weeds, but it is not known whether or not these strains will attack rape.

Ring spot or Black blight (Mycosphaerella brassicicola), which has previously been reported only from the Annaheim - Lake Lenore region, was found on 12 August at Meadow Lake and on 7 September in the Melfort - Nipawin area. The heavy development on stems and siliques at Meadow Lake, at such an early date, indicates that the disease had some effect in reducing yields. The symptom picture was complicated by moderate to heavy infections of black spot (Alternaria spp.) at Meadow Lake and slight infections of the same disease in the Melfort - Nipawin district.

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Stem blight (Sclerotinia sclerotiorum) was present in traces only in north-east Saskatchewan in the Aylsham area, where in some years it has been conspicuous. It caused slight damage in some fields at Meadow Lake where it was responsible for some lodging following a heavy mid-season rain. Traces of a late root rot, caused by Fusarium spp., have been found. It causes a premature ripening-off of affected plants with a softening and bleaching of the bark of the stems. It is felt that this disease might increase with continued rape culture. Traces of aster yellows were reported from Shellbrook, Annaheim, Meadow Lake and Regina.

CEREAL SMUTS IN WESTERN CANADA - 1960

W. Popp.[1]

Loose-smut infection averaged 0.3 percent in Manitoba wheat fields. Infections ranged from 2 to 12.5 percent in Lee wheat and from a trace to 0.1 percent in Durum varieties. No infection was observed in Selkirk or Thatcher.

Bunt of wheat was not in evidence in field inspections. Carload-inspection records of wheat indicate that bunt contamination ("Smutty" cars) in Western Canada was moderate as compared to the past 10-year average. The disease was unusually scarce in Alberta Red Winter wheat; only 1 car graded "Smutty" in 1959 and none, thus far, in 1960.

Infection in barley fields averaged 1.1 percent. Loose smut was the most widespread, occurring in 73 percent of the fields examined with an overall average of 0.6 percent infection. Covered and false-loose smut were found in 22 and 23 percent of the fields with overall averages of 0.2 and 0.3 percent infection, respectively. False-loose smut was more common than usual. High moisture conditions, prevalent in 1959, probably resulted in better inoculation of the seed.

Loose and covered smut were not encountered in a random survey of oat fields. The smuts, however, may have been present in the relatively few fields that were sown with susceptible varieties.

Table 1. Smut in cereal fields of Manitoba - 1960

Cereal	Kind of smut	Per cent smut	
		Range	Mean
Wheat	Loose	0-13	0.3
	Bunt	--	0.0
Barley	Loose	0-8	0.6
	Covered	0-3	0.2
	False-loose	0-5	0.3
Oats	Loose and covered	--	0.0

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Table 2. Bunt of Wheat in Western Canada Aug. 1, 1959 to July 31, 1960

Class of wheat	Cars inspected	Cars graded "Smutty"	Percentage graded "Smutty"
Hard Red Spring	181,217	125	0.07
Amber Durum	13,964	6	0.04
White Spring	216	0	0.00
Alta. Red Winter	654	1	0.15
Garnet	142	2	1.41
Mixed wheat	95	0	0.00
All classes	196,288	134	0.07

Table 3. Bunt of Wheat in Western Canada August 1, 1960 to October 31, 1960.

Class of wheat	Cars inspected	Cars graded "Smutty"	Percentage graded "Smutty"
Hard Red Spring	39,262	15	0.04
Amber Durum	11,927	5	0.04
White Spring	68	0	0.00
Alta. Red Winter	81	0	0.00
Garnet	55	0	0.00
Mixed wheat	35	0	0.00
All classes	51,378	20	0.04

CANADA AGRICULTURE RESEARCH STATION, WINNIPEG, MANITOBA.

YELLOW DWARF OF BARLEY AND RED LEAF OF OATS IN MANITOBA IN 1960

H. A. H. Wallace[1]

Early in July the barley plots at Brandon showed yellowing and, in some plots, the plants were short. It was at first believed that the hot, dry weather might have been responsible. However, in an experiment with 1/125th-acre plots of 16 varieties, replicated four times, one plot in each replicate consistently showed very conspicuous yellowing. The affected variety in each replicate was Husky. Other varieties showed only slight yellowing. Later in the season more severe yellowing, but not dwarfing, was observed at Morden while the yellowing at Portage la Prairie and Winnipeg was less severe. Aphids, identified by P.H. Westdal and G. Robinson as Rophalosiphum maydis, the corn leaf aphid, were collected. This aphid, a poor vector of the barley yellow dwarf virus, was common and widely distributed. Robinson also reported that Rophalosiphum padi, the oat-bird cherry aphid, which is a very efficient vector of the virus was widely dispersed, though relatively scarce.

Very consistent differences in susceptibility were noted between varieties and hybrids. Since Husky was a standard in most experiments this variety was the susceptible check in all cases. In the Western Co-operative test grown at Brandon, Portage la Prairie, Morden and Winnipeg, U. M. 451 was the most resistant variety. The varieties Parkland, O.A.C. 21 and Olli had consistently below average infection. Montcalm was more susceptible. All the Br. hybrids were susceptible, although Br. 5502-11 showed consistently less infection than the other hybrids. The N.D. hybrids were susceptible. In the Joint Project test grown at Morden, Husky was again the susceptible check. However nearly all hybrids in the test were equally susceptible. The exceptions were 5748-9, -11, -15. All other lines of 5748 were very susceptible. 58-606-4 was the most resistant hybrid in the test. In the Eastern Co-operative test grown at Brandon the 5069- lines and the O.B. hybrids were susceptible. Q.B. 4-13 was the only hybrid showing no infection. The Brandon Hybrid test yielded excellent results. Husky and 13 of 15 lines of 5756 were susceptible. Vantmore, and all lines of 5755 and 5758 were resistant. As in the Joint Project the lines of 5748 varied from resistant to susceptible. There were 4 lines of V X H^6 of which two were resistant, one very susceptible, and one somewhere between these extremes.

A disease believed to be red leaf of oats was found in plots adjacent to diseased barley plots at Morden and Brandon. Disease ratings were made for each plot and the results statistically analysed. In the western Co-operative Test at Morden, Garry, Ajax and Several LAC lines had significantly less disease than the O.T. 4832 and R.L. 2123 lines. In the Joint Barley Test at Morden, R.L. 2388 showed no infection. While the 2300 series generally had little disease the 2400 series appeared to be more susceptible. The I.H. series was susceptible. Garry and Ajax again showed good resistance.

While making a survey of the Prairie provinces for barley diseases notes were made on any oat fields infected with red leaf. Only 10 infected fields

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were seen, all in Manitoba and extending from Sprague in the southeast corner westwards to Brandon. Infections were listed as trace (3), and 2, 10, 30, 40, (3), and 95% respectively. Few aphids were observed. Each infected field was an isolated case.

CANADA AGRICULTURE RESEARCH STATION,
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A SURVEY OF BARLEY LEAF DISEASES IN THE PRAIRIE PROVINCES, 1960

H. A. H. Wallace[1]

A field survey of barley leaf diseases was carried out during the period 10-18 August, 1960. The survey was made along the route Winnipeg to Regina, Calgary, Three Hills, Red Deer, Edmonton, Lloydminister, St. Walberg, Price Albert, Swan River, Winnipeg. A total of 247 fields were examined, 89 in Manitoba, 93 in Saskatchewan, and 65 in Alberta. The percentage of fields showing light to severe infection by one or more leaf diseases in 1960, as compared with 1956, (in brackets) was as follows: Manitoba 58 (94), Saskatchewan 84 (74), and Alberta 68 (81). Generally, leaf diseases were more severe in the northern areas. They were much lighter than usual in southern Manitoba.

Spot blotch (*Bipolaris sorokiniana*) was confined mostly to Manitoba and was present only in trace amounts. Net blotch (*Drechslera teres*) occurred as light infections in about two-thirds of the fields examined in the southern parts of each of the three provinces. In northern Saskatchewan and Manitoba more than half the fields had moderate to severe infections, while in northern Alberta infection was quite variable, ranging from a trace to severe.

A trace infection of powdery mildew (*Erysiphe graminis*) was found in one field in Manitoba. Rusts were relatively scarce. Stem rust (*Puccinia graminis*) was encountered as light to moderate infections in seven fields in Manitoba and leaf rust (*Puccinia hordei*) was seen in trace to slight amounts in five Manitoba fields.

Scald (*Rhynchosporium secalis*) was extremely scarce in Manitoba and was found in trace amounts in only two fields in the north part of the province. It was much more prevalent in northern Saskatchewan where 20 of 24 fields examined between St. Walberg and Spiritwood were infected. Some severe infection was seen but most of the infections were light to moderate. Scald was commonly observed in Alberta but usually in trace amounts.

Speckled leaf blotch (*Septoria passerinii*) was scarce, except for local, light infections in the Swan River, Manitoba district and at scattered points in southern Manitoba. It was also found as light infections in 7 fields in the Fairholme to Cater area of northern Saskatchewan. No speckled leaf blotch was found in Alberta. Barley yellow dwarf was observed at Carman, and Treesbank, Pigeon Lake, Manitoba in trace amounts and a light infection occurred at Stead.

Some observations were also made on the occurrence of smuts on barley during the survey. The following amounts were recorded: Loose smut (*Ustilago*

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nuda), in Manitoba; High Bluff 12%, Manson, 6%, Ashville, Headingly and Ste. Agathe, 5%; in Saskatchewan; Stenen, 10%, Wawota, 3%. False loose smut (Ustilago nigra), in Manitoba; Manitonas 10%, Benito, 8%. Covered smut (Ustilago hordei), In Manitoba; Ashville, 5%; in Saskatchewan; Mont Nebo, 10% Fenton, 6%, Kendal and Kelstern, 5%, and Stenen, 4%; in Alberta; Sylvan Lake, 10%.

CANADA AGRICULTURE RESEARCH STATION
WINNIPEG, MANITOBA.

SEVERE LOOSE SMUT IN YORK BARLEY IN SOUTH-WEST ONTARIO

S. G. Fushtey[1]

The first report of an unusually high level of loose smut in barley was received in mid-July from Mr. Don Black, the Agricultural Representative for Wellington County. A spore germination study confirmed that Ustilago nuda was the causal organism. Two more reports followed in quick succession and field and laboratory tests again showed U. nuda to be the pathogen concerned. In all three cases York was the barley variety affected. The amount of smut varied from 6 to 20 per cent as determined by the average of 4 counts of 100 heads in each of 4 rows selected at random.

Immediately following these reports a survey was made in 8 other barley fields in the area. Two were free of smut; 4 showed less than one per cent; one had 10 per cent and one had 19 per cent loose smut. Both fields with the high smut incidence were sown to the variety York.

York is a comparatively new variety which was licensed for sale in 1958. It has high yielding capacity and possesses resistance to stem rust and powdery mildew. Apparently, a number of seed stocks of this variety were turned down for registration in 1959 because of high loose smut rating as determined by the embryo test. It is possible that some of these stocks were marketed as commercial seed which would account, at least in part, for the high incidence of loose smut in the 1960 crop.

It is apparent that York barley is highly susceptible to loose smut as there have been no reports of such high smut incidence in any of the other varieties grown in this area.

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SOME DISEASES ON ORNAMENTALS IN NEW BRUNSWICK[1]

G. B. Orlob[2]

Abstract

Of the numerous diseases of ornamentals a few were found in New Brunswick, while others may have escaped observation. Among the diseases most frequently encountered were: ringspot virus on peony, aster yellows on various hosts, bacterial leaf blight on larkspur, bacterial leaf spot on iris, *Botrytis cinerea* on different plants, fire on tulips, Didymellina leaf spot on iris, Alternaria blight on zinnia, Septoria leaf spot on phlox, and various powdery mildews and rusts.

Introduction

Generally, disease was not a factor in New Brunswick's home-gardens. Although some of the more common diseases were rarely absent from ornamental plants, they received little attention because of a general low disease incidence or because they appeared too late to interfere with the decorative purpose of the crop. Florists seemed more concerned with certain insect pests.

Ornamentals are an extremely heterogeneous group of plants and their disease producing organisms can be expected to be likewise plentiful. In the present report a few diseases are recorded that were found in New Brunswick, especially at the Research Station and some home gardens in the Fredericton area.

Ornamental plants are of little economic importance in the province; there are few commercial growers and the great majority of ornamentals are to be found in the small garden of the amateur florist. Growing conditions in the 1960 season were particularly suitable and allowed an early preparation, sowing, and planting of the flower beds. During May and June plenty of moisture was present but there was less than an inch of rain in August. Mild weather during September and early October favoured a long bloom period for several late summer and fall flowers. Generally, as in most years, the season was favorable for the development of several bacterial and fungal diseases.

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[1] Supported by a grant from the National Research Council, Ottawa, Ont.

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I. Virus Diseases[1]

a. Rinspot on Paeonia

The disease was generally distributed in the Fredericton area but incidence was rather low. In flower beds at the Research Station several varieties were lightly affected. It has been reported (1.) that peony ring-spot is caused by a double infection of tobacco mosaic virus and potato virus X. In the present work mechanical transmission of the disease by means of sap obtained from diseased peony leaves to various tobacco species was not successful.

b. Mosaic on Rosa

A few plants of the variety "Grussen Teplitz" appeared to be infected with rose mosaic virus. Leaf mottling was distinct and plants were dwarfed.

c. Streak on Phlox

This disease has been described from Fredericton in 1941 (2). It was named phlox streak because of the necrotic stripes which developed along the leaf veins and the petioles. Transmission was achieved only by grafting. A 1% infection developed in the 1960 season in the same locality. Infected plants were severely affected and died after several weeks.

d. Mosaic on Dahlia

Symptoms indicative of dahlia mosaic were seen on several varieties, especially Alma Kelly, at the Research Station. Infected plants were of bushy growth and considerably reduced in size. The disease caused some damage since susceptible varieties developed up to 100% infection. In addition to mosaic, some plants developed leaf rolling along with light mottling which possibly could indicate another virus disease.

e. Aster yellows

Aster yellows was the most common and conspicuous virus disease in the area. It was mostly found on Callistephus but was also present on Tagetes and Zinnia. In early September 90% of the China asters grown in a small bed in the Fredericton area were infected. Nearby Gladiolus, although a host plant of the virus, did not produce any sign of infection. Six-spotted leafhoppers, Macrosteles fascifrons (Stal), were first noted in early June. Some weeks later counts in grain fields averaged seven per net sweep. Thereafter, populations of M. fascifrons continued to be high and were found almost everywhere.

f. Streak on Gladiolus

Several viruses could possibly be responsible for white and yellowish streaks found on leaves or petals in beds of Gladiolus at Fredericton. At least three different viruses have been reported to produce somewhat similar symptoms in gladiolus; these are white break, mild mosaic caused by bean yellow mosaic virus, and streak caused by cucumber mosaic virus (1, 3).

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[1] All virus diseases have been identified on the basis of symptoms only. Proof of virus identity is therefore lacking.

II. Bacterial Diseases

a. Pseudomonas delphinii on Delphinium

In the Fredericton area bacterial blight appeared on larkspur on July 6 and was found thereafter in most localities where an appreciable number of the host was grown. Leaf spotting of infected plants was generally light and no serious damage resulted. Bacterial blight was not found on monkshood (Aconitum).

b. Pseudomonas syringae on Syringa

In late May buds of some lilac bushes at the Research Station turned black, and the blossoms and young shoots wilted. The occurrence of the disease appeared to be associated with wet weather. To prevent further spread of the disease, dead or diseased twigs were removed.

c. Pectobacterium carotovorum on Iris

Soft rot was detected on "Blue Rhythm" and other iris varieties in early May. The disease was again noticeable on June 26 but infection was light.

d. Bacterium tardicrescens on Iris

Like soft rot, spread and development of bacterial leaf blight was favoured by wet weather during May. In two flower beds at the Research Station 20% of the plants were infected and developed light to moderate leaf symptoms. The disease was also found in some other localities of the province. Leaf blight continued to be present during most of the growing period but caused little concern.

III. Diseases caused by Phycomycetes

a. Peronospora grisea on Veronica

In the Fredericton area downy mildew, was located on speedwell several plants of which were moderately infected. Later on, powdery mildew Sphaerotheca humuli, appeared on the same plants.

IV. Diseases caused by Fungi Imperfecti

a. Botrytis cinerea

Gray mold is of general distribution on a great variety of garden plants (4). At the Research Station a few German iris showed symptoms of blossom blight but there was no serious damage since infection occurred at the end of the blossom period. Late in summer a trace of blossom blight developed on Cosmos and a 20% infection was present in a border of pansies. B. cinerea was also found attacking leaves and berries of Lonicera in a Fredericton garden.

b. Botrytis paeoniac on Paeoniae

Botrytis blight was found in different localities of the province. "Snow Queen" and various other varieties were attacked at the Research Station at Fredericton but rate of infection averaged not more than 5%.

c. Botrytis tulipae on Tulipa

Fire was first found on "Red Emperor" tulips on May 20, in the Fredericton area. One flower bed of various varieties was severely (80%) infected and damaged by the fungus. In this particular instance, tulips had been grown for several years and no sanitary precautions for the elimination of the disease had been taken.

d. Heterosporium iridis (Didymellina macrospora) on Iris

Leaf spot was another common disease of Iris where it was often associated with bacterial leaf spot. H. iridis was present throughout the growing period, especially after blooming, in several areas where Iris was cultivated. Infection, however, was usually light (10%). The perithecial stage was not found.

e. Cercospora rosicola (Mycosphaerella rosicola) on Rosa

Several rose bushes near Woodstock were moderately (40%) infected on July 27. An incidence of leaf spot was also found in the eastern part of the province. Perithecia, which form in fallen leaves (4), were not found.

f. Alternaria dianthi on Dianthus

Blight was frequently seen in some gardens at Fredericton on Sweet William. Rate of infection was quite variable but did not exceed 40%.

g. Alternaria zinniae on Zinnia

Alternaria blight of Zinnia was more destructive than was the blight on Dianthus and caused some damage in home gardens at Fredericton. Frequently, flowers were blighted.

h. Septoria divaricata on Phlox

This leaf spotting disease was present early in the season on perennial phlox and a 10% infection developed in one flower bed at the Research Station. In August the fungus was isolated from annual phlox where leaf symptoms were generally more severe.

i. Septoria lychnidis on Lychnis

Pycnidia of S. lychnidis were abundantly formed on two plants of Rose Campion. No other plants were present for observation.

V. Diseases caused by Ascomycetes

a. Erysiphe cichoracearum

First symptoms of this common disease appeared in early July on Phlox. By August it was quite general on the host and large areas of the leaves were often covered with the mycelium. The same fungus was present, but was less conspicuous, on Helianthus and Chrysanthemum. Sulfur spraying was often applied too late to do much good.

b. Microsphaera alni

This mildew was present on lilac in all localities inspected. Since it occurred later in the season, after flowering of lilac, most gardeners did not pay much attention to the disease. M. alni also infected species of Lonicera without becoming very injurious.

c. Sphaerotheca pannosa on Rosa

Rose mildew was commonly found but only in one locality at Fredericton was infection serious enough to have caused some damage. At the Research Station powdery mildew was effectively controlled with Karathane.

d. Diplocarpon rosae on Rosa

In early August scattered spots were found on several varieties at the Research Station and other places in the province. In no instance was black spot troublesome enough to have caused great damage. Frequent spraying of rose beds with Captan reduced black spot incidence at the Research Station.

e. Sclerotinia sclerotiorum on Salvia

The fungus caused a stem rot on sage at Fredericton. About 10% of the plants in a single bed were affected, the leaves wilted, and plants soon died. Sclerotia formed within the cottony mycelium.

VI. Rusts

a. Puccinia dioicae on Oenothera

Early in July leaves of Evening Primroses developed orange coloured spots caused by the aecidial stage of the fungus. All plants found in a mixed flower bed were lightly (15%) infected.

b. Puccinia malvacearum on Althaea

In New Brunswick this rust was very common, of general distribution, and caused some damage. First symptoms were noted in early July and increased successively until an average rate of 70% infection was reached late in August.

c. Puccinia millefolii on Achillea

A 50% infection developed on most Sneezeworts (variety "Pearl") in mixed plantings at the Research Station.

d. Coleosporium asterum on Aster

This common rust was observed on asters in the Fredericton area late in September. Infection was widely scattered and too low to have been of any importance.

Literature Cited

1. KÖHLER, E., and M. KLINKOWSKI. 1954. Viruskrankheiten. Vol. 2, Handbuch Pflanzenkrankh., Parey, Berlin. 770 pp.
2. McLEOD, D. J. 1941. in 21st Annual Report, Can. Plant Disease Survey: 96.
3. PIRONE, P. P., B. O. DODGE, and H. W. RICKETT. 1960. Diseases and pests of ornamental plants. Ronald Co., New York. 774 pp.

4. WESTCOTT, CYNTHIA. 1950. Plant disease handbook. D. van Nostrand, New York, 746 pp.

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VEGETABLE DISEASES ON MUCK SOILS IN THE MONTREAL AREA IN 1960

Jacques Simard[1], René Crête[2], and Thomas Simard[1].

During the summer of 1959 a preliminary survey for plant diseases was initiated in the muck soil vegetable producing areas of Ste. Clotilde and Sherrington, south of Montreal. The results of this survey are given elsewhere (3). In 1960, the survey was extended to other muck soil areas in the Montreal region. For convenience, 15 observation stations were established in the following districts: Sherrington, 5; Ste. Clotilde, 4; St. Remi, 1; Napierville, 1; St. Michel, 1; Ste. Sabine, 1; L'Ange-Gardien, 1; and Huntingdon, 1.

From time to time during the summer, the fields at these stations were visited and records taken on the diseases occurring on the different crops. The following disease index was used.

Index	Disease Intensity	Percent Affected Plants
0	None	0
1	Traces	1-10
2	Light	10-30
3	Moderate	30-60
4	Heavy	60-100

The diseases observed in 1960, and their intensity, are presented here in tabular form.

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[3] Simard, J. and René Crête. 1959. Observations sur quelques maladies des cultures de légumes sur terre organique du sud de Montréal. 41e Rapport de la Société de Québec pour la Protection des Plantes. In press.

CROP	DISEASE	REMARKS
ASPARAGUS	Root rot (Fusarium spp.)	Light in one field.
BEET	Leaf spot (Cercospora beticola)	Traces in one field.
CABBAGE	Bacterial leaf spot (Xanthomonas vesicatoria var. raphani)	Traces in one field.
	Drop (Sclerotinia sclerotiorum)	Light in one field.
	Downy mildew (Peronospora parasitica)	Light in a one-acre experimental plot on the Ste. Clotilde Substation.
CARROT	Leaf blights (Alternaria dauci and Cercospora carotae)	Light at the end of June; light to moderate in six fields at the end of August; heavy in three fields in September.
	Root-knot nematode (Meloidogyne spp.)	Light to moderate in five fields.
	Aster yellows (aster yellows virus)	Light to moderate in two fields. Leafhopper populations were low most of the summer.
CELERY	Damping-off (Rhizoctonia and Pythium spp.)	Moderate to heavy in three seed beds. Heavy losses (40-50%) in one bed.
	Early blight (Cercospora apii)	Light in one field.
	Late blight (Septoria apii-graveolentis)	Light in one field.
	Pink rot (Sclerotinia sclerotiorum)	Traces in one field.
	Aster yellows (aster yellows virus)	Traces in one field.
	Magnesium deficiency	Traces in three fields.
CUCUMBER	Angular leaf spot (Pseudomonas lachrymans)	Moderate in one field.
	Scab (Cladosporium cucumerinum)	Traces in one field.
	Anthracnose (Colletotrichum lagenarium)	Traces in one field.
LETTUCE	Downy mildew (Bremia lactucae)	Light to moderate in five fields.
	Drop (Sclerotinia sclerotiorum)	Traces to light in five fields.
	Bottom rot (Rhizoctonia solani)	Traces in four fields.
	Aster yellows (aster yellows virus)	Traces to light in four fields.
	Mosaic (virus)	Light in six fields.
	Calcium deficiency	Traces in one field, especially along ditches.

CROP	DISEASE	REMARKS
ONION	Purble blotch (Alternaria porri)	Traces to light in four fields.
	Smut (Urocystis cepulae)	Light in one field.
	Nitrogen and calcium deficiencies	Light in two fields.
POTATO	Wilt (Verticillium albo-atrum)	Light in one field.
	Purple top (aster yellows virus)	Traces in one field.
	Frost injury	Traces to light in two fields at the end of May and at the end of August.
TOMATO	Curly top (beet curly top virus)	One plant was seen in experimental plots on the Ste. Clotilde Substation.

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A SURVEY OF CERTAIN VEGETABLE GROWING AREAS IN ONTARIO FOR THE OCCURRENCE OF ROOT-KNOT NEMATODE

R. M. Sayre[1]

Introduction

During the past few years the Nematology Section of Research Station at Harrow, Ontario has received an increasing number of plant specimens which showed either the presence of, or damage by, the root-knot nematode. Most of the specimens were submitted by growers who farm muck soil. It was evident that root-knot nematode should be investigated and, in doing so, special consideration be given to muck areas. In consequence, a survey was carried out, the main purposes of which were to determine the species of the nematodes involved, the extent of their occurrence, the amount of damage they did to cultivated crops, and the possible role of weeds as reservoir hosts. The findings of the survey, carried out during the summer of 1960, are reported below.

Methods and Procedures

Samples of crops, weeds and soil were obtained from 43 fields in six widely separated areas in Ontario. In each field 20 crop plants were selected at random and removed from the soil with a minimum of root disturbance. These roots, freed of soil by shaking, were examined for nematode galls and categorized on the visual evidence of nematode damage as follows: None - no galls, Slight-galls on 1 to 4 roots, Moderate - galls on 5 to 9 roots, Heavy - galls on 10 or more roots. A portion of the root of each specimen showing galls was saved for more detailed examination and identification of the nematode by the methods described by Taylor et al. (2). A similiar procedure was followed with respect to weeds growing in the fields.

In each field, samples of soil, taken from the top four inches at 10 random locations, were bulked and mixed. A 1.5-pound sample of the mixture was regarded as representative of the field. The samples were assayed by using tomato seedlings as indicator plants; the number of galls occurring on their roots after four weeks being regarded as indicative of the nematode population in the field.

Results

Identity of the nematode

An attempt was made to examine the perineal pattern of at least five of the females obtained from each root sample. The perineal pattern, a characteristic used in identification, is the finger-print-like pattern formed by the annulations of the cuticle in the perineal region of the body of the female. Most of the patterns

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were rounded, with low dorsal arches and some were flattened dorsally, features which indicated that the species involved was either *Meloidogyne hapla* or *M. arenaria*. At least one of the patterns in five had punctuations which indicated that *M. hapla* was a constant component of the nematode population. Moreover, a characteristic host reaction to *M. hapla* (1), observed on the various crops indicated almost conclusively that *M. hapla* was, if not the only, then by far the most predominant species encountered in the survey.

Field incidence and soil infestation

Visual examination of specimen crop plants showed that 26 of the 43 fields sampled were infested with root-knot nematode, whereas the assay of soil samples revealed the presence of the nematode in only 14 fields. It would appear that assay is a less reliable method for demonstrating the presence of the nematode in fields. The location of the fields and the relative degree of infestation, as indicated by the two methods, are shown in Table 1.

Table 1. Nematode infestation as shown by two methods.

		Fields Infested		Degree of Infestation		
Areas Surveyed	Fields Surveyed	Assay Method	Plant Exam.	Slight	Mod.	Heavy
Port Colborne	3	3	3	0	1	2
Burlington	4	1	1	1	0	0
Grand Bend	12	3	7	4	1	2
Holland Marsh	15	5	9	1	3	5
Jeannette's Creek	7	1	4	1	2	1
Harrow	2	1	2	1	0	1
Total	43	14	26	8	7	11

Host infestation

A. Cultivated crops. Seven crops were examined in the field and all were found to be susceptible to root-knot nematode. Differences in their degree of susceptibility were noted during the laboratory examination of roots. According to Sasser's (1) categories, lettuce was the most susceptible, followed by celery, carrots, and onions in that order of decreasing susceptibility. Too few samples of other crops were taken to establish their relative susceptibility.

B. Weeds. Fourteen species of weeds growing in the surveyed fields were examined for the presence of root-knot nematode. Seven were found to be infested: oak-leaved goose foot, *Chenopodium glaucum* L.; Canada thistle, *Cirsium arvense* (L.) Scop.; wild carrot, *Daucus carota* L.; annual daisy fleabane, *Erigeron annuus* (L.) Pers.; spotted knot weed, *Polygonum persicaria* L.; cinquefoil, *Potentilla intermedia* L.; and sow thistle, *Sonchus asper* (L.) Hill. Seven others were free of infestation: ragweed, *Ambrosia artemisiifolia* L.; pigweed, *Amaranthus*

retroflexus L.; lamb's quarters, Chenopodium album L.; prostrate knot weed, Polygonum aviculare L.; purslane, Portulaca oleracea L.; dock, Rumex crispus L.; and pennycress, Thlaspi arvense L.

Discussion

It is clear from the foregoing that Meloidogyne hapla, the northern root-knot nematode, is becoming a problem of increasing importance in most of the vegetable-growing areas of southern Ontario. More than one-half of the fields surveyed were infested, as shown by the plant examination method. This suggests that many growers in the areas concerned must have incurred some loss as the result of nematode damage to their crops. As a matter of record, 15 of 28 growers visited had either plowed under some portion of their crop acreage or had resorted to soil fumigation because of nematode damage.

Of practical, as well as of academic interest is the fact that vegetables differ in their degree of susceptibility to the pest; lettuce being the most susceptible followed by celery, carrots and onions. Crop susceptibility, however, has apparently little or no direct bearing on the losses caused by root-knot nematode; the most serious losses being sustained by growers of carrots, a crop of moderate susceptibility. In carrots, of course, it is the edible portion of the plant that is attacked and which must be discarded even though showing only slight nematode damage. Then, too, carrots have a longer growing season than the more susceptible crops and are thus exposed to attack for a longer period in infested soils. In the case of lettuce and celery, the roots, rather than the edible portion of the plant are attacked and nematode damage can be compensated for by a heavier application of fertilizer.

While several weeds were shown to be hosts for M. hapla, their significance in regard to initiating or perpetuation of field populations of the nematode is not known . Field observations also yielded some evidence of a possible correlation between amount of snow coverage and degree of nematode injury. Both these points require further investigation.

Acknowledgements

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Literature Cited

1. SASSER, J.N., 1954. Identification and host-parasite relationships of certain root-knot nematodes (Meloidogyne spp.) Bulletin A-77; Univ. of Maryland, College Park, Md.
2. TAYLOR, A. L., V.H. DROPKIN and C.C. MARTIN. 1955. Perineal pattern of root-knot nematodes. Phytopathology 45: 26-34

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OBSERVATIONS ON THE OCCURRENCE OF GRASS AND FORAGE DISEASES IN NEW BRUNSWICK[1]

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Abstract

Many of the organisms that attack the grass family in other parts of North America also occur in New Brunswick. Limited surveys of wild and cultivated grasses in 1960 showed that leaf diseases were the more conspicuous and prevalent ones. Among grass diseases commonly found in the province were: Drechslera leaf blight and scald on quackgrass, tar spot on quackgrass and bent grasses, Ovularia leaf spot on bent grasses, Drechslera leaf spot and scald on smooth brome grass, eye spot and scald on orchard grass, leaf streak and eye spot on timothy, and different rusts and powdery mildews on various hosts. Although the effect of any single disease upon a grassland community is relatively mild, the combined attack of various diseases can be serious. It is estimated that grass diseases were responsible for a 5-10% reduction in the yield and quality of the hay crop. Forage legumes, such as the clovers and alfalfa, harbored a variety of diseases which were often widespread and troublesome. Diseases of prime importance were: common leaf spot, anthracnose, powdery mildew and rust on red clover; black stem and common leaf spot on alfalfa. Losses caused by these diseases might have been in the neighbourhood of 10%.

Introduction

Observations on some grass diseases were made in connection with a cereal disease survey (2), as well as by inspecting local grassland in the Fredericton area. The scope of the survey made it necessary to limit the areas covered, the intensity of search, and the variety of grasses inspected. Consequently, only the more common grasses found in pastures, meadows, forage fields or in other plant communities were examined for disease in some fifteen localities within the province. In New Brunswick many grasses must be considered of economic importance, making up as they do, the herbage of the natural or cultivated grasslands used for forage. In contrast, cultivated clovers and alfalfa do not occupy a large acreage and are therefore of little agricultural importance in the province. A brief appraisal of the diseases found on forage legumes was included in the survey.

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[1] The survey was supported by a grant from the National Research Council, Ottawa.

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A. GRASS DISEASES

1. Diseases on Agropyron

a. Bacterial blight (Xanthomonas translucens f. sp. cerealis)

An incidence of bacterial blight was seen on June 4, in the Fredericton area. Only two infected plants were found and blight was not encountered in other localities or later in the season.

b. Head mold (Fusarium avenaceum)

This fungus prefers marine or moist climates (3) and has been previously reported to occur on cereal crops in New Brunswick. In 1960 it was not observed on any small grains (2) but a trace infection was present on quackgrass in the Fredericton area.

c. Leaf blight (Drechslera tritici-repentis)[1]

This widely distributed disease was seen in the province in several localities, especially in the northern and eastern regions. Rate of infection was was quite variable in different areas but was generally light (10%). All collections were made during early July and no perithecia of Pyrenophora tritici-repentis were found.

d. Scald (Rhynchosporium secalis)

Scald caused considerable leaf spotting on quackgrass near Fredericton and in localized areas in the eastern part of the province. However, the fungus was more prevalent on smooth brome grass, which apparently is attacked by a different physiological race of R. secalis (3).

e. Speckled leaf blotch (Septoria elymi)

Early in the season, a few plants of A. repens were found to be lightly affected by speckled leaf blotch. As pointed out by Sprague (3), the short and narrow conidia of this fungus are readily separable from other Septoria spp. occurring on the same hosts.

f. Ergot (Claviceps pupurea)

Quackgrass was one of several grasses attacked by this omniparasitic fungus. Infections were widely scattered and within the trace range.

g. Powdery mildew (Erysiphe graminis)

Several grasses were affected by powdery mildew but the disease was most prevalent and destructive on quackgrass. Rate of infection was quite variable and seemed to be connected with the ecological conditions of the growing site. A 50-80% infection was common in several localities.

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[1] The nomenclature proposed by Shoemaker (Can. J. Botany 37:879:87) is followed throughout this article.

h. Tar spot (Phyllachora graminis)

The black, sunken spots produced by this fungus were sometimes found on A. repens. In most localities a trace infection had developed by July 28, but in two grassland fields at Fredericton infection reached a level of 20%.

i. Stripe smut (Ustilago striiformis)

On July 5, stripe smut was found on quackgrass near Fredericton. However, the rate of infection was low and infected plants were rare in other localities later in the season.

j. Rusts (Puccinia recondita, P. graminis)

Of the rust fungi attacking quackgrass, leaf rust appeared first and a trace infection was common in most places. Stem rust was more severe later in the season.

2. Diseases on Agrostis

a. Eye spot (Mastigosporium rubricosum)

Up to 20% of Agrostis stolonifera was found infected in a meadow near Hartland. Ratings for diseased plants averaged 10% and damage was negligible. The disease was certainly more prevalent on orchard grass.

b. Leaf spot (Ramularia pusilla)

Early in July this disease was widespread on Agrostis tenuis, A. stolonifera and A. perennans, but only a few spots had developed. A few weeks later a heavy infection was found in one locality near Fredericton. Severely infected leaves withered progressively from the tip but only a few spores were produced.

c. Twist (Dilophospora alopecuri)

On June 30, a trace infection was found on Agrostis tenuis in grassland near Fredericton. Twisted, malformed shoots and heads were the striking symptoms of the disease. Sprague (3) did not list Agrostis as a host plant of this fungus.

d. Tar spot (Phyllachora graminis)

Red top and brown-top were subject to tar spot and a trace infection was found in several localities near Fredericton and Woodstock. As pointed out by Sprague (3), the disease was more prevalent along the edges of woods where suitable microclimatic conditions prevailed.

e. Rusts (Puccinia recondita, Puccinia graminis)

Agrostis perennans developed a trace infection of leaf rust. Later on more damage was inflicted by P. graminis on A. stolonifera growing in the western part of the province.

3. Diseases on Anthoxanthum

a. Brown stripe (Passalora graminis)

This disease, which occurred on a variety of grasses, was also noticed on Anthoxanthum odoratum. On this host, however, brown stripe was quite rare.

b. Ergot (Claviceps pupurea)

A few infected plants were seen in central New Brunswick. Sweet vernal grass is not listed in Sprague's host plant list for the fungus (3).

c. Stem rust (Puccinia graminis)

On this host stem rust was rarely encountered and only a few infected plants were found in a waste lot near Fredericton.

4. Diseases on Bromus

a. Purple brown spot (Stagonospora bromi)

The fungus was isolated from Bromus ciliatus growing along roadsides in Victoria County. The disease was quite common in these localities and produced a 20% infection. Pycnospores of S. bromi were not unlike those of Septoria nodorum obtained from wheat (2).

b. Leaf blotch (Drechslera bromi)

Leaf blotch appeared early in June and was the most prevalent disease of the season. It was found in most localities on Bromus inermis and was also common on different varieties of smooth brome grass grown in nurseries at the Research Station at Fredericton.

c. Scald (Rhynchosporium secalis)

Scald was another common disease of B. inermis. Generally, it caused light damage but leaf spotting was severe in some localities near Fredericton and in eastern New Brunswick. Like Drechslera leaf spot, scald was most prevalent in spring and early fall.

d. Ergot (Claviceps purpurea)

Some ergot was encountered on a few plants of B. inermis in most areas.

e. Head smut (Ustilago bullata)

Occurrence of this smut was restricted to western New Brunswick. Five per cent of B. ciliatus in two localities was infected and developed the conspicuous sori in the spikelets.

5. Diseases on Calamagrostis

a. Head mold (Fusarium avenaceum)

In early August F. avenaceum was locally abundant and had caused leaf blight on blue joint growing in thick stands along the St. John River valley. Although this fungus attacks more generally the heads of Gramineae, it has been found to incite stem canker; a shoot blight has been reported from Quebec (3). Re-examination of the stands a few weeks later did not show any advance of the disease. Further spread and development was probably checked by a drought during August.

b. Eye spot (Mastigosporium rubricosum)

Symptoms of eye spot were frequently observed on Calamagrostis canadensis and the rate of infection in marshes along the St. John River averaged 10%. Eye spot was more prevalent and destructive on orchard grass.

c. Ergot (Claviceps purpurea)

Blue joint was also attacked by this fungus. As with most other grasses, infection was widely scattered and within the trace range.

d. Crown rust (Puccinia coronata f. sp. calamagrostidis)

About 10% of blue joint around Fredericton was slightly infected (10-20%) by late August. Earlier in the season the aecial stage of the fungus developed on Rhamnus alnifolia. Only a few pustules were seen on this host.

6. Diseases on Dactylis glomerata

a. Eye spot (Mastigosporium rubricosum)

This disease was evident on leaves of orchard grass in early June. The rate of infection was quite variable throughout the province; in some localities up to 90% of the plants developed moderate leaf symptoms, while the disease was absent in other regions. Little was seen of the disease during the summer months.

b. Scald (Rhynchosporium orthosporum)

Scald was one of the more prevalent diseases found in the province. Like eye spot, scald appeared early in the season but was also common throughout the summer and early fall. It was a rare event not to find the disease on its host. Rate of infection averaged 30-40% for most localities.

c. Brown stripe (Passalora graminis)

Brown stripe was sometimes found on orchard grass but the disease was of little consequence on this host.

7. Diseases on Glyceria

a. Leaf spot (Septoria avenae)

A leaf spot caused by S. avenae was found on Glyceria striata and G. canadensis in the Fredericton area. Spores from this host material compared closely with those of S. avenae obtained from oats. A related fungus, S. glycericola also attacks various species of manna grass, but possesses somewhat narrower spores with pointed ends (3).

b. Brown Stripe (Passalora graminis)

Brown stripe was often seen on Glyceria grandis in areas of the St. John River valley, and rate of infection averaged 20% in two localities. There was a high percentage of 3-septate spores averaging 50u x 10u, whereas spores from other hosts are mostly 1-septate and are somewhat smaller.

c. Brown smut (Ustilago longissima)

Several plants of G. grandis were parasitized by this fungus near Fredericton. Numerous brown sori had developed on the leaves.

8. Diseases on Festuca

a. Twist (Dilophospora alopecuri)

The fungus was collected from Festuca elatior in late June at different sites near Fredericton and in the western parts of the province. The disease was widely scattered and of no importance. Because of the striking symtomatology, twist disease could be easily located in most of the grasslands inspected.

b. Net blotch (Drechslera dictyoides)

This fungus causes a net blotch, which closely resembles that produced by Drechslera teres on barley. It has been reported that the disease is so common in the eastern United States that it may serve to identify its host plant in the vegetative stage (3). Trace infections were found in two meadows near Fredericton and Woodstock.

c. Leaf spot (Ramularia pusilla)

Spots indicative of the common Ramularia leaf spot were found in trace amounts in meadows in the western part of the province. Spores of the obscure fungus were seen on some of the collected material.

d. Brown stripe (Passalora graminis)

This common parasite of grasses was also found on F. rubra. However, the disease was not very common on this host and only a few infected plants were present in two localities at Fredericton.

e. Blast (Spermospora subulata)

A light infection of 20% occurred on 30% of the red fescue growing in a waste place near Fredericton. Symptoms of the disease were quite distinct and scald-like lesions diffused over the lower parts of the leaves and the sheaths.

f. Saprophytic fungi

The scattered pycnidia of two fungi were found on necrotic tissue of F. rubra. One fungus had brown, elongated spores and was probably close to Phaeoseptoria festucae; the other, probably Hendersonia culmicola, had bacillar pycnospores.

g. Ergot (Claviceps purpurea)

The first case of ergot in 1960 was recorded on red fescue late in July. There were only a few infected plants and on these the sclerotia were sparsely scattered.

9. Diseases on Lolium perenne

a. Ergot (Claviceps purpurea)

The highest incidence of ergot was seen at Fredericton in a small experimental plot of perennial ryegrass where 60% of the plants were infected. About 25% of the head was replaced by the sclerotia.

10. Diseases on Phleum pratense

a. Eye spot (Heterosporium phlei)

Eye spot was a rather common and sometimes destructive disease affecting an estimated one-third of the timothy. It was found as early as May 4 and was present throughout the growing period. Heavily infected leaves became yellow and died prematurely. Rate of infection was about 25% in the spring but less during summer.

b. Brown stripe (Passalora graminis)

This disease was without doubt the most common one occurring on Gramineae. It was observed early and by June 6 was found on virtually all the timothy examined. Since timothy is extensively grown in the province and is equally abundant in natural grass associations, brown stripe must have been responsible for light (1-5%) reduction in quality of the hay.

c. Stripe smut (Ustilago striiformis)

Stripe smut was without consequence as only a few infected plants were collected in Sunbury County.

d. Stem rust (Puccinia graminis)

Although stem rust on timothy was restricted in its range, it caused severe damage in local areas. The first few pustules were seen on July 1 near Fredericton; four weeks later a 50% infection had developed in the same locality.

11. Diseases on Poa

a. Purple spot (Drechslera vagans)

Purple spot was more prevalent during late spring, apparently favored by the cool and rainy weather. At that time of the season an estimated one-tenth of Kentucky bluegrass was lightly (10%) infected.

b. Brown stripe (Passalora graminis)

The disease was regularily encountered on Poa palustris in all parts of the province. On this host, however, brown stripe was rather mild, producing only a few scattered lesions on the leaves.

c. Powdery mildew (Erysiphe graminis)

Powdery mildew as a common disease of Kentucky bluegrass. Infections ranging from trace to 70% were seen in grasslands at Fredericton, Woodstock, and Chatham.

d. Stripe smut (Ustilago striiformis)

A trace infection of stripe smut was recorded on turf in one locality at Fredericton.

e. Leaf rust (Puccinia poae-nemoralis)

Both P. pratensis and P. palustris were subject to leaf rust. The disease was found in the central and eastern part of the province. At the Fredericton Research Station a 20% infection developed in nurseries on Kentucky bluegrass.

f. Leaf mold (Epicoccum nigrum)

Sporodochia and spores of this fungus had developed on a few leaves of P. pratensis. Epicoccum is considered as saprophytic on dead plant parts (3).

B. FORAGE LEGUME DISEASES

1. Diseases of Alfalfa

a. Spring black stem (Ascochyta imperfecta)

All six alfalfa fields examined at Fredericton and in eastern New Brunswick were found to be lightly (10-20%) infected by early June. Some damage occurred as a result of defoliation. Black stem was no problem later in the season on second cut alfalfa.

b. Leaf spot (Stagonospora meliloti

The fungus was isolated in its Stagonospora stage from alfalfa leaves. In two fields at the Fredericton Research Station 30% of the crop was lightly (10%) infected. No root rot symptoms were encountered.

c. Leaf spot (Stemphylium botryosum)

One third of the plants in an alfalfa field at Fredericton were lightly (20%) affected on July 6, but no appreciable damage could be attributed to this leaf spot. A few infected plants were found in the same locality in early September.

d. Common leaf spot (Pseudopeziza trifolii f. sp. medicaginis-sativae)

This disease of worldwide distribution was also the most common disease on alfalfa in New Brunswick. It was found on June 11, in the Fredericton area, and three weeks later in all other localities where alfalfa was grown. Disease incidence averaged 30% except in one field in which plants were more severely affected.

e. Yellow leaf blotch (Leptotrochila medicaginis)

Yellow leaf spot was scarce and found only in one alfalfa stand in Northumberland County. Rate of infection averaged 20% on one third of the crop and some defoliation was noticed on more heavily attacked plants.

2. Diseases of Clover

a. Viruses

Symptoms indicative of virus diseases were seen, at least in trace amounts, in all localities. No identifications have been made because of the complex nature of such studies.

b. Sooty Blotch (Cymadothea trifolii)

The slightly elevated blotches of this disease appeared early in June on Trifolium repens and were seen thereafter throughout the growing period. Sooty blotch was also found on red clover but appeared less prevalent on this host. Infection was usually widely scattered and of low density except in forage nurseries at the Research Station where an incidence of 30% infection occurred on white clover.

c. Northern anthracnose (Kabatiella caulivora)

Anthracnose was a major disease in local areas though not of general distribution. In two badly infected fields in western New Brunswick, losses caused by the disease were estimated as high as 25%. In three other fields in the northern part of the province the disease was also present but less severe.

d. Common leaf spot (Pseudopeziza trifolii)

This leaf spot was also common on red clover and alsike clover, and was often more prevalent than on alfalfa. This disease was found in every field inspected. Rate of infection averaged 30%.

e. Powdery mildew (Erysiphe polygoni)

This powdery mildew was one of the most common diseases in the province. Epiphytotics developed on red clover during late summer and early fall. Rapid development and spread of the disease in 1960 may have been accelerated by the dry summer weather. It is believed that mildew epidemics are favoured by relatively dry weather during the summer months(1).

f. Rust (Uromyces trifolii)

Rust was common and of considerable importance on red clover in late summer. Rust and powdery mildew reduced both the yield and quality of red clover. A 50% infection was found in several localities.

Literature Cited

1. DICKSON, J. G. 1947. Diseases of field crops. McGraw-Hill Co., New York. 429 pp.
2. ORLOB, G. B., and R. H. E. BRADLEY. 1960. Cereal diseases encountered in New Brunswick in 1960. Can. Plant Disease Survey. 40:2. 92-97. 1960.
3. SPRAGUE, R. 1960. Diseases of cereals and grasses in North America. Ronald Press Co., New York. 528 pp.

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THE EFFECTS OF THE WEATHER ON LATE BLIGHT AND TUBER QUALITY

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Abstract

Abnormally low rainfall, together with generally low atmospheric humidity and strong, dry winds, prevented a late blight epidemic on Prince Edward Island in 1960. Tubers harvested early in September, near the end of a hot, dry period, were high in specific gravity. The dry period was followed by rain which increased the volume of the crop but decreased the specific gravity of the tubers. Stem-end discoloration was severe in tubers from plants destroyed by top killer when soil moisture was low; no discoloration occurred in tubers from plants killed when soil moisture was at a normal level.

Introduction

The July-September season of 1960 was the second driest on record as shown by meteorological and late blight incidence tables extending back to 1922 at Charlottetown. During the thirteen weeks from July 1 to September 29, the precipitation was only 5.73 inches (Table 1) or approximately one-half the 39-year mean for the period. An additional 0.70 inches of rain on September 30 raised the total precipitation to 6.43 inches for the entire three-month period. The 39-year record of dryness for the three-month period was established in 1945 when only 6.38 inches was recorded. The wettest July-September period was that of 1942 when the precipitation totalled 20.10 inches.

The extremely dry season of 1960 provided the opportunity to study late blight of potato (Phytophthora infestans) under a rare set of weather conditions for Prince Edward Island; to investigate the effect of low rainfall on the specific gravity of tubers; and to check the possible role of drought as a factor contributing to the incidence of stem-end discoloration following the killing of the tops by chemical sprays.

I. LATE BLIGHT

Late blight made its initial appearance in a field of Irish Cobblers at York on July 14, a new "zero date" and seven days earlier than average. The threat, however, failed to develop beyond a few scattered trace infections, and a very few moderate infections in some shore areas where occasional fogs provided additional moisture for the fungus.

The reason for the comparatively disease-free season is quite readily explained from the meteorological data, a summary of which is given in Table 1. It was an unusually dry season. Rain volume, however, does not in itself provide

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Table 1. Weather Summary - 1960

Week	Mean Temp.	Mean Hum.	Rain Inches	Total Rain Inches	Dates of Rain 1	2	3	4	5	6	7	No. Rains
July 1-7	65.5	72.4	0.26	0.26			R	R	R			3
July 8-14	66.4	81.0	0.59	0.85		R		R		R		3
July 15-21	68.1	73.3	1.11	1.96			R		R	R	R	4
July 22-28	66.4	72.7	0.14	2.10			R			R		2
July 29-Aug. 4	69.7	77.4	0.07	2.17			R		R	R		3
Aug. 5-11	65.6	75.6	0.26	2.43	R	R		R				3
Aug. 12-18	69.2	72.4	0.00	2.43				T*				
Aug. 19-25	69.4	84.4	0.61	3.04		R		R	R	R		4
Aug. 26-Sept. 1	69.2	59.2	0.12	3.16				T			R	1
Sept. 2-8	61.0	65.1	0.00	3.16		T						
Sept. 9-15	63.9	71.9	1.30	4.46	R	R	R	R	R			5
Sept. 16-22	52.7	74.1	1.26	5.72			R		R	T		2
Sept. 23-29	57.3	78.3	0.01	5.73							R	1
Sept. 30			0.70	6.43	R							1
Total				6.43								32
Mean	64.9	73.7										

*Unmeasured trace.

the answer. There have been years when blight was severe although the rainfall was well below average; and there have been years when blight was rare although the rainfall was considerably above average for the July-September season. Examples are 1957 and 1959 in which severe late blight epidemics occurred when precipitations were 7.82 inches and 7.03 inches respectively, and 1935 and 1940 in which no blight and only a trace occurred under rainfalls of 15.69 inches and 13.11 inches respectively.

A study of late blight-weather relationships for the 1922-60 period has shown that rain volume as a factor in the development and spread of the disease is governed by the frequency of the rains and by the character of the fine intervals. Humidity and wind are the governing factors. Thus a year with a high volume of rain may produce little disease if a large portion of the precipitation falls in a few widely-spaced heavy rains, the intervals between being characterized by low relative humidities and drying winds. The year 1957 was in marked contrast to the above conditions. The small volume of 7.82 inches recorded for the thirteen weeks from July 1 to September 29 was made up of recorded rains on 37 separate days. In addition to these recorded rains there were seven days in which unmeasured trace amounts fell and there were seven weeks in which the mean relative humidities were between 80.6 and 89.4, the mean for the thirteen weeks being 80.8.

The season of 1960 was quite generally characterized by low relative humidities and strong, dry winds which not only made it impossible for late blight to develop but also produced the worst forest fires in the history of the province.

In an attempt to build up an infection in the plots in which fungicides are screened, water suspensions of late blight spores were disseminated frequently over the plants in the unsprayed buffer and border rows. The first dissemination was made on July 20, and by July 28 from one to three lesions were found in a few of the rows. Repeated attempts, many of them in evenings, were made through August and into September, and in the latter part of this period the spores were sprinkled over the sprayed plots as well. By September 20, when the test was terminated by the application of top killer, only 15 per cent defoliation had occurred in the unsprayed check plots.

II. SPECIFIC GRAVITY OF TUBERS

The rainfall for the ten weeks beginning July 1 was only 3.16 inches and the amounts for the last four weeks of this period were 0.00, 0.61, 0.12, 0.00 inches respectively. During the last week of this extremely dry period Green Mountain tubers were dug and individually tested for specific gravity. The specific gravities ranged from 1.082 to 1.104 with the mean at 1.094. These values would give starch percentages in the range of 15.88 to 20.30 with the mean at 18.27 and dry matter percentages in the range of 21.00 to 25.62 with the mean at 23.50.

The weeks of September 9 and September 16 produced 1.30 inches and 1.26 inches of rain respectively (Table 1) and plant growth was stimulated. The plants in the same plots used for the first specific gravity analysis were destroyed by spraying them with a top killer on September 20 and a few days later the tubers were dug. The crop had benefited a great deal, in respect to volume, from the rains; the tubers being considerably larger than they were on September 2, However, it was found that the increased volume had been achieved at some expense to specific gravity; the individual tuber range dropping back to 1.073-1.091 with the mean at 1.084. These specific gravity values would give starch percentages in the range of 13.97 to 17.68 and a mean of 16.24; dry matter percentages would be in the 19.00 to 22.87 range and the mean at 21.37.

III. STEM-END DISCOLORATION

A brown discoloration in the xylem, and frequently in the adjacent parenchyma as well, sometimes occurs in the stem end of tubers from plants that have been killed down by spraying with top-killing chemicals. The cause of this phenomenon is not clearly understood although it has been investigated by many research workers. In general, the workers agree that a positive correlation exists between the rapidity of the killing and the amount of discoloration, but in some experiments no correlation was indicated. Reports concerning effect of the age of the plants when killed are confusing, some workers (1, 7, 9, 10) presenting data to show that more discoloration occurs when the tops are killed early and others (2, 3, 6, 12) that discoloration is greater when the plants are killed at or near maturity. It was apparent in one experiment in Maine (5) that discoloration induced by top killing increased with the age of the plants until they were maturing from natural causes, then decreased. In another Maine test (4) the date of killing was of no significance.

The above antithetic results seemed to indicate that the experiments were being influenced by some other condition, probably climatic. It is known that the discoloration occurs more frequently on the west coast of North America than in states and provinces on the eastern side. The phenomenon has never been reported from Great Britain. Hoyman (8, 9, 10) as well as Kunkel and his associates (11) have published data from well-organized field experiments to show that drought increased the discoloration. These results were confirmed by Callbeck(3) in greenhouse tests but Meadows (12) failed to establish them in her studies at Cornell.

Advantage was taken of the drought conditions on Prince Edward Island in 1960 to study the influence of soil moisture on the phenomenon. Green Mountain potatoes, planted on May 26, were killed on September 9, or 106 days after planting, and the same variety, planted May 31, was killed on September 20, or 112 days after planting. Thus there was only a 6-day difference in the ages of the two groups. A sodium arsenite top killer at the concentration of five quarts per 100 gallons of water was used in both cases and applied at the rate of 100 gallons per acre. In each case, the tubers were examined 14 days after spraying the plants.

It will be observed in Table 1 that September 9 was at the end of an extremely dry period while the plants killed on September 20 had received 2.56 inches of rain in the interim. Thus one group was killed when the soil was very dry; the other group when the soil was reasonably moist. On cutting and examining the tubers it was found that those from the plants killed during the drought period had stem-end discoloration. In most tubers the symptoms were classified as severe, in some tubers the discoloration having affected the vascular ring for a considerable distance beyond the point of stolon attachment. No discoloration was apparent in the tubers from plants killed when the soil moisture was normal.

Literature Cited

1. CALLBECK, L.C. 1947. Killing potato tops with chemicals. Add. and Proc. Ont. Crop Imp. Assoc. Potato Section:11-20.

2. CALLBECK, L.C. 1948. Current results with potato vine killers in Prince Edward Island. Amer. Potato Jour. 25:225-233.

3. ______________ 1949. Potato vine killing in Prince Edward Island. Amer. Potato Jour. 26:409-419.

4. CUNNINGHAM, C.E. and MICHAEL GOVEN. 1950. Potato vine killing trials. Me. Agr. Exp. Sta. Bull. 483.

5. ______________, P.J. EASTMAN and MICHAEL GOVEN. 1952. Potato vine killing methods as related to rate of kill, vascular discoloration, and virus disease spread. Amer. Potato Jour. 29:8-16.

6. EASTMAN, P.J., MICHAEL GOVEN and B.E. PLUMMER, JR. 1949. Potato vine killing experiments. Me. Agr. Exp. Sta. Bull. 473.

7. HOYMAN, WM. G. 1947. Observations on the use of potato vine killers in the Red River Valley of North Dakota. Amer. Potato Jour. 24:110-116.

8. ______________. 1948. Potato-vine killers (Abstract). Amer. Potato Jour. 25:52.

9. ______________. 1951. Tuber discoloration following vine killing (Abstract). Report of Proc. Third Ann. Conference on Potatoes, Red River Valley Potato Research Center, East Grand Forks, Minn.

10. ______________. 1952. Relation of water supply to xylem disoloration of potato tubers caused by vine killing. Amer. Potato Jour. 29:113-122.

11. KUNKEL, R., W.C. EDMUNDSON, J.S. GREGORY and A.M. BINKLEY. 1951. Potato vine killing in relation to stem end discoloration of the tubers (Abstract). Report of Proc. Third Ann. Conference on Potatoes, Red River Valley Potato Research Center, East Grand Forks, Minn.

12. MEADOWS, MARION W. 1950. A study of the factors affecting vascular discoloration in potatoes. (Thesis) Cornell University, Ithaca, N.Y.

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CEREAL DISEASES ENCOUNTERED IN NEW BRUNSWICK IN 1960[1]

G. B. Orlob[2] and R. H. E. Bradley[3]

Abstract

Many of the more common cereal diseases were found to be present in New Brunswick during a survey in 1960. Only a few diseases, however, assumed a general distribution and a high density in the fields. First in importance were the two leaf spotting diseases on oats, Drechslera avenacea and Septoria avenae. On barley, Drechslera teres was widely distributed. Another group of diseases was present in several localities but disease ratings in the fields were too low to be of any great consequence. The following diseases would be in this category: barley yellow dwarf, halo blight, barley spot blotch, wheat glume blotch, powdery mildew, ergot, and different smuts and rusts. A third group was made up of diseases that were found in one locality only and infection was low, usually in the trace range.

Generally, losses from individual diseases were not serious. In oats, the average damage from all diseases was estimated to be about 5% for the province.

Introduction

A disease survey was carried out in 1960 to study the distribution and severity of cereal diseases as they occur in New Brunswick. Small grains, especially oats, are of considerable importance in the province. Their culture is concentrated along the St. John river valley, which is also the main potato growing area. During the summer of 1960 better than average growing conditions prevailed; favorable weather permitted timely planting while conditions in early summer favored good growth of the crop. August rainfall which was less than one inch, was much below normal, but this drought probably came too late to affect most of the grain crops. In all other months there was plenty of moisture to provide conditions for the development of foliage disease on small grains.

A total of 104 fields were examined throughout the province, particularly in the western, eastern and northern part. Surveys were conducted on four different occasions from June to August so as to follow the seasonal development of diseases. This survey was confined to rather general records on disease occurrence and more information is needed to understand the biology of New Brunswick's endemic cereal pathogens.

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[1] This survey was supported in part by a grant from the National Research Council, Ottawa, Ont. Contribution No. 43, Research Station, Canada Department of Agriculture, Fredericton, N.B.

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I. OAT DISEASES

The main cereal crop in New Brunswick is oats, of which some 130,000 acres are grown annually. The most common varieties are Fundy, Ajax, and Abegweit, while various other varieties occupy little acreage. A total of 76 oat fields were surveyed.

A. Blast (non-parasitic)

Blasting of florets was seen in 40% of the fields but ratings generally did not exceed the trace to 1% range. In one field in Carleton county a moderate (30%) incidence was observed. Blasting may also develop following infection with barley yellow dwarf virus.

B. Red Leaf (barley yellow dwarf virus)

This disease was widely distributed throughout the province and was found in most (70%) fields by July 5, and in every field inspected on July 27. The often experienced concentration of yellow dwarf in widely spaced experimental plots was evident in nurseries at Fredericton. In several plots 10 to 30% infection developed, in another plot 40% of Clintland oats were infected. Other than this incidence, occurrence of yellow dwarf in farmers' fields was low and was within the trace range. Aphids of the *Rhopalosiphum fitchii-padi* complex were commonly found on oats early in the season, while *Macrosiphum avenae* Kirby was present in increasing numbers during late June and early July. Transmission experiments incriminated both species as possible vectors.

C. Halo Blight (*Pseudomonas coronafaciens*)

Halo blight was widespread in plantings at the Experimental Station at Fredericton, affecting 25% of the oat plots on June 16. Another infected stand (15%) was found near Chatham in the eastern part of the province. In both instances foliage of infected plants developed only few lesions. The advance of drier weather seemed to have checked further spread of the disease.

D. Leaf Blotch (*Drechslera avenacea*)

Symptoms of leaf blotch appeared early and were found in all fields surveyed by July 5, with infection ranging from a trace to 80%, with 10% being more commonly encountered. Later in the season, leaf blotch continued to be prevalent, infecting up to 100% of the plants. Lesion development on individual infected plants was not severe (5 to 20% of the leaves) and no severe damage could be attributed to leaf blotch alone. After the appearance of *Septoria* the diseases could be separated only with difficulty, because both pathogens frequently infected the same plants and produced somewhat similar symptoms.

Although *Drechslera victoriae* has been reported from the province (1,4), it was not encountered during the course of the present survey. *D. avenacea* and *D. victoriae* are difficult to distinguish on early infected oats in the seedling stage except through culture. Later, however, *D. victoriae* causes necrosis of the root system and lower nodes, while no such symptoms occur with *D. avenacea* (4).

E. Anthracnose (*Colletotrichum graminicola*)

In Westmorland county parts of a field exhibiting rather unthrifty growth were found to be slightly (5%) infected by *C. graminicola*. The disease seems generally to be associated with dry soils, low in fertility (2). Anthracnose was also found on several grasses (3).

F. Brown Stripe (*Passalora graminis*)

Like *C. graminicola* this fungus was more commonly found on different kinds of grasses, (3) although a trace infection was present in one oat field near Fredericton.

G. Speckled Leaf Blotch (*Septoria avenae*)

The two leaf spotting diseases incited by *Drechslera avenacea* and *Septoria avenae* were the most prevalent cereal diseases in the province. In contrast to *D. avenacea*, speckled leaf blotch appeared rather late and was not encountered in all localities before late July. Due to this delay and a somewhat less severe infection of the plants, damage was considered to be less than in previous years (1). The dry weather during August may have prevented extensive spread of the disease. Out of 20 fields inspected on July 27, 4 were lightly (trace to 15%) affected, 4 moderately (15 to 50%), and 12 severely (50 to 100%) affected. As in the case of *D. avenacea* most individual plants attacked by *S. avenae* showed a low to moderate degree (10 to 30%) of infection. All oat varieties in nurseries seemed equally susceptible to speckled leaf blotch.

H. Smuts (*Ustilago avenae* and *U. kolleri*)

Both loose and covered smut were found in trace amounts in 30% of the fields examined. One field near Hartland in the western part of the province had 1 to 5% infection. On this particular farm no seed treatment had been used for several years.

I. Rusts (*Puccinia coronata*, *P. graminis* f. sp. *avenae*)

Light infection of *Rhamnus cathartica* by the aecidial stage of *P. coronata* was seen at Fredericton and near Moncton. On oats, crown rust was found first in the eastern part of the province on July 27, which is about the normal date for its appearance (1). At this time the disease was still absent in all other parts of New Brunswick. By August 13, most fields in the eastern and central section of the province had been infected but only a few fields in western N.B. were invaded. Crown rust ratings were 50% for all fields with the foliage of infected plants generally being lightly (5%) affected.

Stem rust was not found in farmers' fields but was abundant in a late planted experimental plot at Fredericton.

II. BARLEY DISEASES

Barley is of minor importance in New Brunswick with only about 3,000 acres being grown annually. Standard varieties are Charlottetown 80 and Parkland, two-rowed barley being the more generally grown type. A certain proportion of barley is grown mixed with oats. The survey included 16 fields in eastern and western New Brunswick.

A. Yellow Dwarf (Barley yellow dwarf virus)

This disease was found in 90% of the barley fields, although the amount of infection seemed to be lower than in oats. In addition to the two common grain aphids found on oats, the corn leaf aphid, *Rhopalosiphum maidis* Fitch colonized barley and was shown to transmit some isolates of the virus.

B. Bacterial Streak (*Xanthomonas translucens*)

The presence of this disease was obvious in nurseries at Fredericton, where various varieties developed 5 to 10% infection. The occurrence of the disease seemed to be associated with plots of dense stand and vigorous growth which resulted in conditions favorable for infection and secondary spread of the organism. Bacterial streak was not found in farmers' fields.

C. Net Blotch (*Drechslera teres*)

Net blotch was the most common disease of barley. Like *D. avenacea*, net blotch appeared early in the season and increased in severity until the crop ripened. The disease incidence averaged 5% on July 5, and 20 to 60% infection was present on July 27. In two instances probably all plants in the fields were infected and leaf infections were severe (80%), so that considerable damage must have resulted. *D. teres* was more common on *Hordeum distichon*.

D. Spot Blotch (*Bipolaris sorokiniana*)

The fungus was isolated from its leaf spotting phase, although it was very likely present early in the season, causing seedling blight. Spot blotch was found in most fields of six-rowed barley. Infection up to 40% was noted in some experimental plots at Fredericton. In contrast to net blotch, spot blotch was more common on six-rowed barley.

E. Smuts (*Ustilago nuda*, *U. nigra*, *U. hordei*)

Although all three smut fungi were encountered in many localities, loose and semi-loose smut were the most common ones. On July 27, 5 out of 8 fields showed trace infection of these pathogens and one field had a 1% infection. Covered smut was found in 3 fields, 2 of them had trace infections, and in one field 1% of the plants were infected.

F. Rust (*Puccinia hordei*)

Leaf rust was found in trace amounts in 2 fields in Carleton County where a few widely scattered pustules were observed on some plants.

III. WHEAT DISEASES

Only about 3,000 acres of wheat are grown in isolated areas in the province. Eight fields of spring wheat were surveyed in the western part (Carleton, Victoria county) as well as the eastern part (Northumberland county) of the province.

A. Yellow Dwarf (Barley yellow dwarf virus)

Based on symptomatology, this disease seemed to be present in the Fredericton nurseries although no attempts at recovery were made. Similarly, some plants developing symptoms indicative of yellow dwarf were observed in other localities. In wheat, yellow dwarf was less common than in oats or barley.

B. Downy Mildew (*Sclerophthora macrospora*)

A 1% incidence of this disease occurred in a field in Victoria county. The distribution of downy mildew in the field was associated with areas with high moisture content. It is belived that *S. macrospora* requires abundant free moisture for zoospore distribution and infection (2). Apparently downy mildew has not been previously found in Canada on cereals. (4).

C. Molds (*Cladosporium herbarum*, *Alternaria tenuis*)

Black molds were present on several varieties in plots at Fredericton. A trace of infected heads developed "deaf ears". Both fungi, however, are considered to be saprophytic (4).

D. Glume Blotch (*Septoria nodorum*)

The disease was recorded from two fields in Victoria county, but was more prevalent along the eastern shoreline. Lesions appeared on both leaves and glumes. Trace to 1% infections had developed in these localities by July 27.

E. Rusts (*Puccinia recondita*, *P. graminis* f. sp. *tritici*)

Moderate leaf rust infection (40%) occurred in nurseries at Fredericton. Spring wheat was less heavily attacked than was winter wheat. In other parts of the province little leaf rust was noticed. Stem rust infection was light (1%) in some experimental plots. The aecidial stage was present on barberry.

IV. RYE DISEASES

Rye is rarely grown in New Brunswick. Surveys were confined to plots at Fredericton containing several winter rye varieties and to 4 fields in the eastern part (Westmorland county) of the province.

A. Patchy Germination

All rye fields inspected showed a high degree (30 to 80%) of uneven standing,

which should have necessitated replanting. Failure of the crop is often attributed to winter killing and rye is considered promising only under exceptional circumstances (1). This year's plots at Fredericton did well, however, and it is possible that factors other than lack of winter hardiness were responsible for uneven stand.

B. Scald (*Rhynchosporium secalis*)

One field showed a trace infection of scald. The fungus was more common on certain grasses.

C. Powdery Mildew (*Erysiphe graminis*)

A light (trace to 20%) infection of powdery mildew developed in nurseries. In 2 fields mildew was widespread but infection of individual plants was rather light and only a few mycelial pads were observed.

D. Ergot (*Claviceps purpurea*)

Ergot was found in the province in all surveyed fields but not in nurseries at Fredericton. Infection did not exceed the trace range. Ergot was more common on a variety of grasses than on rye (3).

E. Rusts (*Puccinia recondita*, *P. graminis* f. sp. *secalis*)

Leaf rust was found in all localities where rye was grown. The highest incidence (50%) was found in some plots at Fredericton. *P. recondita* was also present in some farmers' fields but only a few pustules were scattered over the infected leaves and no great damage was caused by the disease. A trace of stem rust was noticed in the nurseries.

Literature Cited

1. CHIASSON, T.C. Unpublished data, Canada Department of Agriculture, Fredericton, N.B.
2. DICKSON, J.B. 1947. Diseases of field crops. McGraw-Hill Co., New York. 429 p.
3. ORLOB, G.B. 1960. Observations on the occurrence of grass and forage diseases in New Brunswick. Can. Plant Disease Survey 40:2. 78-86.
4. SPRAGUE, R. 1950. Diseases of cereals and grasses in North America. Ronald Press Co., New York. 528 p.

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1960 PEA DISEASE SURVEY IN THE OTTAWA VALLEY

V. R. Wallen

A total of ten fields of field and garden peas were examined for the incidence of disease in an area from Renfrew to Ottawa.

The incidence of virus diseases was particularly noted in fields observed at the Central Experimental Farm. Of the four fields examined, all showed virus infection to some extent. In one field of Chancellor peas three distinct virus diseases were found; pea streak was severe on 50 percent of the plants, common mosaic was moderate on 50 percent of the plants and enation mosaic was slight on 5 percent of the plants. In the same field Fusarium wilt and root rot was severe on 20 percent of the plants. Pea streak was also present in two fields of Arthur and Chancellor field peas and in one field of garden peas, variety Director. Pea virus diseases were noted only on the Central Experimental Farm.

Two fields of Delwiche Scotch field peas grown at Douglas and Shawville were moderately to severely infected with root rot. Subsequent isolation revealed that *Ascochyta pinodella* was responsible for this condition. One field of this variety grown at Richmond was free of disease.

Trace infections of Septoria leaf spot caused by *S. pisi* were noted in a field of Chancellor field peas grown at Antrim and a field of Delwiche Scotch grown at Shawville. A moderate infection on the lower leaves of most plants was noted in a field of Delwiche Scotch peas grown at Douglas.

Two fields of the new field pea variety Creamette were found to be free of disease. Information received later revealed that this variety produced over 50 bushels of seed to the acre.

For the first time since I began annual surveys for the incidence of pea diseases, no evidence of the leaf and pod spot disease of peas caused by *Ascochyta pisi* was noted.

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ASTER YELLOWS IN NOVA SCOTIA IN 1960

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Aster yellows reached epidemic proportions in Nova Scotia in 1960 for the first time since the serious outbreak of 1944, when infection in carrot fields averaged 20 percent and a record high of 40 per cent was found in one field. In fact, although the disease can always be found in weed hosts in the province, it appeared to be on the decline, especially since 1955, with annual losses ranging between 1 and 5 per cent in carrots and occasional outbreaks in beds of *Calendula* and *Callistephus*. Aster yellows in 1959 was at a very low ebb except in some fall crops of lettuce in the Grand Pre and Sydney areas where growers for several years have been experiencing a rapid build-up of the disease from July onward, rendering late field plantings of lettuce unprofitable. In the Kentville area there was nothing to indicate that an outbreak would develop in 1960, although the closely-related green petal of strawberries and phyllody of clover were unusually abundant in the spring of 1959.

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The disease was first recorded in 1960 on 12 July in a planting of Callistephus where four of the fifty plants were diseased. A severely diseased plant of Tragopogon pratensis was nearby. Two weeks later the first specimens of diseased carrots were seen and investigation showed the field from which they came to be 15 per cent infected with aster yellows. The number of carrots submite submitted for diagnosis soon after this brought the realization that a general infection of early-planted carrots had occurred some time in June. Mr. V.R. Vickery, Entomologist, reported that nymphs of Macrosteles fascifrons were present in exceptionally large numbers.

Between 10 and 12 August a survey was made of a number of crops and ornamental plantings in Kings County. Aster yellows infection was rated as follows: carrots, 20-25%; lettuce, 35%; parsnips, 10%; potatoes, trace -3%; tomatoes, trace -5%; squash and buckwheat showed trace infections. Among the ornamentals infection ratings were: Callistephus, 100%; Tagetes, up to 100%; Calendula, 2%; and Petunia, 1%. The following weeds were also found to be infected; fall dandelion (Leontodon autumnalis), wild carrot (Daucus carota), goats-beard (Tragopogon pratensis), pineapple weed (Matricaria matricarioides), daisy flea-bane (Erigeron annuus), ragweed (Ambrosia artemisiifolia), ox-eye daisy (Chrysanthemum leucanthemum), brown-eyed Susan (Rudbeckia hirta), dandelion (Taraxacum officinale), sow thistle (Sonchus arvensis and S. aspera), plantain (Plantago major), lady's thumb (Polygonum persicaria) and spurrey (Spergula arvensis). Suspicious symptoms were also seen on alfalfa, Dahlia, Dianthus and hardy chrysanthemum.

In early September the extensive plantings of annual flowers in the Grand Pre National Park were examined and symptoms of aster yellows were evident on the following: Callistephus, 50%; Tagetes, 20%; Matthiola, 15%; Matricaria, 5%; annual phlox, 10%; Petunia, 2%; Linaria, Celosia, Nigella, Calendula, Zinnia and perennial phlox, trace. Widely scattered plants of Daucus carota, Leontodon autumnalis and Erigeron annuus in the area were infected.

A survey was made, late in September, in the vegetable growing district of Cole Harbor, Halifax County, in response to a request to investigate the complete loss of lettuce and spinach crops by two growers. The lettuce was found to be 95-100% infected and an adjoining spinach field was severely stunted and yellowed. A small carrot field showed 30% hairy root and parsnips showed 1% infection. Parsley and dill were infected in trace amounts. Severe bolting had occurred in several rows of Swiss chard, and aster yellows was suspected to be the cause. Nasturtiums in the vicinity were 10% infected. A number of weed species in the surrounding headlands were heavily infected.

A number of carrot fields were visited at harvest time. The most severely infected, an early planted field, had 30% culls from hairy root and 60% of the plants showed foliage symptoms. Yellows in later planted fields ranged between 15% and 40% with 10 to 25% of the roots showing hairy root. Very late planted fields had few foliage symptoms and no hairy root.

Table 1. Estimated losses expressed as percent of crop.

	Annapolis Valley	Cole Harbor	Sydney
Carrots			
Early	20	-	-
Mid-Season	15	-	-
Late	5	-	-
Lettuce	5	100	15
Spinach	-	100	-
Parsnips	10	-	-
Tomatoes	2	-	-
Potatoes	2	-	-
Squash	trace	-	-

Both the outbreaks in 1944 and 1960 occurred during dry summers. Table 2 shows the amounts of rainfall at Kentville for the period May - August in the two years.

Table 2. Rainfall at Kentville, N.S. Summers 1944 and 1960

	1944	1960	Mean (45 yr.)
May	0.22	2.35	2.75
June	2.88	2.67	2.79
July	2.30	1.55	2.74
August	3.02	2.02	3.44
Total	8.42	8.59	11.72

It is estimated that the most serious spread of aster yellows in carrots occurred in mid-June in fields seeded in early May. Later infections were not so severe. Carrots planted after the middle of June had only 20-40% foliage symptoms and very little hairy root. Plantings made in early July showed only 5% foliage symptoms and no hairy root. It is possible that some of the reduction in disease in the late-seeded crops was due to the widespread use of DDT for control of the leafhopper. The serious outbreak on lettuce at Cole Harbor would indicate that August infection was important in that area.

An interesting observation made in November was that three Calendula plants showed symptoms of phyllody. These were growing in a garden near strawberries with green petal and clover which exhibited symptoms of phyllody. Many of the remaining Calendula plants showed typical yellows symptoms.

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SOME RECORDS OF PLANT-PARASITIC NEMATODES ENCOUNTERED IN CANADA IN 1960

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Root-knot Nematodes

The northern root-knot nematode, *Meloidogyne hapla* Chitwood, 1949, was found on intercepted material from the United States, on rose from Texas, Arizona, Iowa, and Michigan. It was intercepted on importations of rose from Denmark, on three importations from Holland, and on importations from Germany, England, and Belgium. This species was found on two interceptions of tomato from Georgia, on *Syringa, Lonicera, Ligustrum* and *Spiraea* from Michigan, on pink and red peony roots from Iowa, on *Weigelia* sp. from New York, on barberry from Pennsylvania, on strawberry from Indiana, and on *Viburnum dentatum* from Iowa.

The southern root-knot nematode, *Meloidogyne incognita incognita* (Kofoid & White, 1919) Chitwood, 1949, was intercepted on importations of tomato from Georgia, *Sansevieria* sp. from Illinois and Florida, *Weigelia* sp. from Tennessee, and three times on rose from Texas.

The cotton root-knot nematode, *Meloidogyne incognita acrita* Chitwood, 1949, was found on interceptions of *Sansevieria* sp. from Florida, and of tomato from Georgia.

The peanut root-knot nematode, *Meloidogyne arenaria arenaria* (Neal, 1890) Chitwood, 1949, was intercepted on rose from Texas and Holland, on *Berberis thunbergii atropurpurea* from Holland, and on honeysuckle from Tennessee.

Thames' root-knot nematode, *Meloidogyne arenaria thamesi* Chitwood, 1949, was found on an importation of rose from Holland.

The Javanese root-knot nematode, *Meloidogyne javanica* (Treub, 1885) Chitwood, 1949, was intercepted on tomato from Georgia. A root-knot nematode, *Meloidogyne* sp., was found attacking the roots of rose from the Bowmanville area in Ontario.

Cyst-forming Nematodes

The golden nematode, *Heterodera rostochiensis* Woll., 1923, was found on the roots of shamrock imported from Ireland.

A recent survey of soils in Prince Edward Island, New Brunswick, and Nova Scotia revealed that the clover cyst nematode, *Heterodera trifolii* Goffart, 1932, was prevalent in several areas in each of these Provinces.

Root Lesion Nematodes

Pratylenchus penetrans (Cobb, 1917) Filipjev & Schuurmans Stekhoven, 1941 was intercepted on *Spiraea* from Michigan, and on lilac from New York.

Pratylenchus pratensis (de Man, 1880) Filipjev, 1936 was found on intercepted *Forsythia* sp. from Michigan. It was found on grass from Richmond and Merivale, Ontario, on strawberry from Prince Edward Island, on white clover from Luskville, Quebec, on oats from the Ottawa area, Russell, Lombardy, St. Albert, and Kilmarr's Corners, Ontario, on grass from Antrim, Finch, Dunrobin, Russell, and Morewood, Ontario, and on alfalfa from Bourget, Ontario.

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Pratylenchus minyus Sher & Allen, 1953 was found on an interception of rose from Hong King, on clover from Richmond, Ontario, and on oats from Metcalfe and Lombardy, Ontario.

Pratylenchus convallariae Seinhorst, 1959 was found on interceptions of lily-of-the-valley pips from Germany, and on pips of Convallaria sp. from Holland.

Tylenchids

A stylet nematode, Tylenchorhynchus maximus Allen, 1955, was found on Coleus from the Ottawa area, on grass from Merivale, Finch, Smiths Falls, Kars, Manotick, and Dunrobin, Ontario, and from Aylmer, Quebec, on violet from Dunrobin, on oats from Kilmarr's Corners, from the Ottawa area and Russell, on alfalfa from Kars, Berwick, and Bourget, and on clover from Russell and Embrun, Ontario.

Tylenchorhynchus nudus Allen, 1955 was found on an interception of Weigelia sp. from Michigan, U.S.A.

Tylenchorhynchus dubius (Buetschli, 1873) Filipjev, 1936 was found on intercepted shamrock from Ireland and on strawberry from Prince Edward Island.

Tylenchorhynchus brevidens Allen, 1955 occurred on alfalfa from Antrim, on clover from Richmond and Antrim, on oats from Metcalfe, and on grass sod from Smiths Falls, Ontario.

Tylenchorhynchus claytoni Steiner, 1937 was found on an interception of Magnolia from England, and on red clover from Russell, Ontario.

Tylenchorhynchus martini Fielding, 1956 occurred on an interception of nursery stock from Hong Kong.

Tylenchorhynchus acti Hopper, 1959 was found in soil from Europe.

Pin Nematodes

A new species of Paratylenchus which is being named and described by Dr. L. Y. Wu, Nematology Section, Entomology Research Institute, Ottawa, was recorded from clover from Smiths Falls and grass from Richmond, Ontario.

Paratylenchus macrophallus (de Man, 1880) Goodey, 1934 was found on interceptions of Dianthus sp. and geranium from Europe.

Hoplolaimids

Scutellonema brachyurum (Steiner, 1938) Andrassy, 1958 was found on an interception of nursery stock from Hong Kong.

Helicotylenchus erythrinae (Zimmermann, 1904) Golden, 1956 was found on grass from Morewood, and on oats from Russell and Embrun, Ontario.

Ring Nematodes

Criconemoides lobatum Raski, 1952 was recorded from grass from Richmond, North Gower, Kars, Manotick, Russell, and Finch, from oats from Kars, Kilmarr's Corners, the Ottawa area, Chrysler, and Embrun, from clover from McLaren's Landing, Richmond, Kars, Russell, Metcalfe, Chesterville, Berwick, Casselman, Embrun, Bourget, and Smiths Falls, from cedar seedlings from McLaren's Landing, Ontario, and from wild strawberry from Breckenbridge, Quebec.

Criconemoides curvatum Raski, 1952 occurred on alfalfa from Kars, and on cherry seedlings from Fitzroy Harbour, Ontario.

Aphelenchids

Aphelenchus avenae Bastian, 1865 occurred on importations of shamrock from Ireland, on Caladium from New Jersey, on Lebanon-tree seedlings from Lebanon, on nursery stock from Hong Kong, on Dianthus sp. and geranium from Europe, and on peach seedlings from a nursery, Strathroy, on clover and timothy from Richmond, and on grass from Kars, Ontario.

Aphelenchoides parietinus (Bastian, 1865) Steiner, 1932 was recorded on an importation of pips of Convallaria sp. from Holland, and on Spiraea from Michigan.

Dorylaimids

Xiphinema americanum Cobb, 1913 was found on grass from Manotick, and on cedar seedlings from McLaren's Landing, Ontario.

Longidorus elongatus (de Man, 1876) Thorne & Swanger, 1936 occurred in soil imported from Switzerland.

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RESEARCH BRANCH,
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BLUEBERRY LEAF SPOT

J. F. Hockey[1]

Leaf spotting on lowbush blueberry became apparent in commercial plantings within a month after bloom during 1960 and by harvest had caused a 75% defoliation in many areas. Sprout fields were free from leaf spotting until September when a severe infection was observed in many fields in Colchester and Cumberland counties.

Isolations from affected tissues, in the laboratory, have produced several fungi but fruiting of fungi on affected leaves has been extremely sparse. A variety of fungi have been found on fallen leaves but their pathogenicity has not been established.

A leaf spot found on parts of a clone exposed to full sunlight, but not found on parts under partial shade, has been tentatively classified as either a micro-climate or photochemical reaction. Affected tissue has been found to be sterile.

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FORECASTING LATE BLIGHT OF POTATO IN THE MONTREAL AREA IN 1960

Thomas Simard[1]

Abstract

According to the results obtained at five different localities in the Montreal district, Hyre's rainfall-temperature method of forecasting late blight of potato reflected quite well the situation during the 1960 growing season. Blight was not forecast for Ste. Clotilde and it was not reported from this locality nor was it found in unsprayed potato plots. Blight was reported at Lennoxville and Duvernay, the only localities where it was likely to occur according to the method of forecasting used. At Ste. Clotilde, Hyre's method of forecasting was supplemented by the 90% relative humidity-temperature method developed by Wallin.

Introduction

Late blight of potato is not endemic in the Montreal region. Its occurrence and severity vary from year to year, as does the date on which it is first reported. It appears as an epidemic in approximately one year out of five.

The proper timing of fungicide applications is difficult under these conditions. Better and more economical control could be obtained if the annual occurrence of late blight was correctly forecast and the information relayed to the growers through a Spray Warning Service.

With this in mind, a study of methods of forecasting late blight was initiated in 1960. This paper is a preliminary report on this work.

Methods and Procedure

The principal method employed in this study was the moving-graph or rainfall-temperature method devised by Hyre (1). For comparison, the 90% relative humidity-temperature method developed by Wallin (2) was also used at one station. These methods can be briefly described as follows(3):

"By the rainfall-temperature method the initial occurrence of blight is forecast after 10 consecutive days when both rainfall and temperature are favorable, and the current weather forecast is for continued blight-favorable weather. Rainfall is considered favorable when the 10-day total is 1.20 inches or more. Temperature is considered favorable when the 5-day average is less than 78°F. Any day is considered unfavorable, however, if the minimum temperature is less than 45°F. An unfavorable day due to low temperature is not allowed to interrupt the count of consecutive favorable days. That day is simply omitted from the count. The disease is expected 1 or 2 weeks after it is forecast. Once blight is established, 10 favorable days are no longer required for it to spread. A degree of flexibility is desirable in applying these criteria."

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The relative humidity-temperature method used was developed by Dr. Jack Wallin. Hygrothermographs are located 12 to 15 inches above ground in shelters placed near the field. Blight severity values are calculated as follows:

"The relation of the hours duration of given average temperature coincident with relative humidities above 90% to the estimated severity of secondary infection of *Phytophthora infestans*."

Average Temp. range, °F.	Hours that produce indicated infection severity[a] 1	2	3	4
45 - 53	16 - 18	19 - 21	22 - 24	25 +
54 - 59	13 - 15	16 - 18	19 - 21	22 +
60 - 80	10 - 12	13 - 15	16 - 18	19 +

[a] 1=0 to trace secondary infection; 2=trace to slight; 3=slight to moderate; 4=moderate to heavy.

A tentative interpretation of severity values is as follows: If the hygrothermograph is activated at the time of emergence of the potatoes, late blight symptoms are not expected before a cumulated severity value of about 20 is reached. After this "zero" time a severity value 1 per week keeps the fungus alive, 3 or more during a 7-day period calls for fungicide treatment, and the pathogen is considered dead if there are no severity values for 3 or more consecutive weeks".

A part of this study was conducted at the Ste. Clotilde Sub-Station for organic soils in co-operation with Dr. Russell A. Hyre. The required meteorological data and hygrothermograph charts from Ste. Clotilde were forwarded weekly to Dr. Hyre who made the forecasts. These were included in the cooperative study made by Dr. Hyre at several localities of northeastern United States and the province of New Brunswick.

In order to investigate the effect of location on the occurrence of late blight, one more station south of Montreal, at Lennoxville, and three north of Montreal, at Duvernay, St. Thomas and Lavaltrie, were observed in addition to Ste. Clotilde. Forecasts for these stations were made by the author.

Finally, potato plots to be sprayed according to the forecasts were established in the Ste. Clotilde district.

Results

At Ste. Clotilde, as estimated by the rainfall-temperature criteria, there were only 8 consecutive faborable days in the second half of June, the remainder of the season being unusually dry. The cumulative severity values as determined by Wallin's method were only 10 for the season. By following either of the two methods, no late blight was forecast and no blight was found. Neither was any blight detected in the potato plots left unsprayed all season.

At the other stations, only the rainfall-temperature method was used. According to this method, the first occurrence of late blight is predicted 7 to 14 days after 10 consecutive favorable days. Positive forecasts were made for the four stations, but blight was reported only from two.

If we keep in mind that first blight infections are very hard to detect and, also, that continued favorable weather is necessary for blight to establish itself, spread, and be easily detected, the above results reflect quite well the situation prevailing in 1960. At Lennoxville, the first infection was forecast to occur at the beginning of July. Its spread was favored by a spell of 19 nearly consecutive unfavorable days, after which blight was reported on August 15. Unfavorable weather prevented further spread during August.

The first blight infection was predicted to occur at Duvernay at the beginning of August. Three weeks of dry weather at that time slowed, but did not apparently prevent, its development, since the disease was found in the district during September, following a period of several favorable days during the latter part of August.

At both St. Thomas and Lavaltrie, localities only a few miles apart, the first appearance of blight was forecast for the beginning of July. However, it seems that its establishment was prevented there by the unusually dry summer of 1960.

Acknowledgements

I wish to thank Dr. Russell A. Hyre, Plant Pathologist, U.S. Department of Agriculture, University of Delaware, Newark, Del., for his kind collaboration; also the personnel of the following organizations: the Sub-Station for organic soil at Ste. Clotilde, particularly Mr. Jacques Jasmin, Director; the Experimental Farms at Lennoxville and L'Assomption (Lavaltrie); the Provincial Plant Protection Stations at Duvernay and St. Thomas.

Literature Cited

1. HYRE, R.A. 1954. Progress in forecasting late blight of potato and tomato. Plant Dis. Reptr. 38: 245-253.
2. WALLIN, Jack. 1957. U.S. Dept. Agr. Plant Disease Situation Report 28.
3. HYRE, Russell A. 1960. U.S. Dept. Agr. Plant Disease Situation Report 13.

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NEMATODE RECORDS FROM SAANICHTON, BRITISH COLUMBIA IN 1960

J. E. Bosher[1]

The examination of 107 samples of roots and soil from strawberry plantings in B.C. showed that nematodes were present as follows: 67 samples were infested with *Pratylenchus penetrans*, the population was rated as heavy in 13 samples and light in two. *Paratylenchus* sp. was found to be heavy in 11, and light in 13 samples. *Xiphinema* sp. was found in 23 samples and *Heterodera trifolii* as cysts or cysts and larvae was found in 29 samples, in most cases associated with leguminous weeds.

A survey of approximately 230 acres of potatoes in the Pemberton Valley of B.C. revealed the presence of *Meloidogyne hapla* in 2 fields, representing approximately 10.5 acres. *Pratylenchus* sp. was found in the plantings of 14 growers of about 40 acres and *Paratylenchus* sp. was present in 18 fields, representing 80 acres. *Heterodera trifolii* was found in 22 fields totalling 100 acres. The nematodes occurred as relatively small populations in most samples.

Significant populations of *Xiphinema americanum* were found in soil samples from Saskatoon from a crab-apple orchard and from spruce and poplar in a forest nursery at Indian Head, Sask.

Pratylenchus penetrans was found in significant populations in the roots of *Syringa vulgaris*, *Phlox decussata*, *Narcissus*, rose, apple, peach and raspberry, in all cases associated with plant decline. A trace population of *P. penetrans* was also found in a sample of *Thuja* recently imported from Europe.

Meloidogyne incognita was recorded from *Saintpaulia* newly imported from the U.S.A. and *M. hapla* was recorded from *Impatiens* from a greenhouse at Edmonton, Alberta. *Ditylenchus dipsaci* was found in two soil samples from the Fraser Valley and in two fields on Vancouver Island, B.C. *Ditylenchus destructor* was found in one planting of *Iris* at Brentwood, B.C.

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RESISTANCE OF ROSE VARIETIES TO RUST

R.G. Atkinson[1]

Observations in August and October of hybrid tea rose varieties growing in close association at the Experimental Farm, Saanichton, B.C., revealed marked differences in relative susceptibility to rust.

Trace - Slight	Moderate	Severe	No Rust
Aug. 16, 1960			
Spek's Yellow	Mrs. Henry Morse	McGredy Sunset	Cynthia Brook
Elegante		Contessa de Sastago	Mrs. H.M. Eddy
Saturnia		Royal Visit	Etoile de Hollande
Grand Duchess Charlotte		Mde. Eduard Herriot	Charlotte Armstrong
			President Hoover
			Shot Silk
October 13, 1960			
Lady Forteviot	Spek's Yellow	Contessa de Sastago	No varieties free of Rust
Mrs. Sam McGredy	Grand Duchess Charlotte	Mrs. Henry Morse	
Shot Silk	Charlotte Armstrong	President Hoover	
Peace	Elegante	Saturnia	
Etoile de Hollande		Mrs. H.M. Eddy	
		Cynthia Brook	
		Mde. Eduard Herriot	
		Royal Visit	
		McGredy Sunset	

It is interesting to notice that the apparent resistance shown earlier by varieties Cynthia Brook, Mrs Eddy and President Hoover broke down and these were heavily infected in October. On the other hand, the early resistance of Etoile de Hollande and Shot Silk was for the most part maintained as these showed only a trace of rust in October.

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RESISTANCE OF OUTDOOR CHRYSANTHEMUM VARIETIES TO RUST:

R. G. Atkinson and W.R. Orchard[1]

The following disease ratings for rust were made October 27, 1960, on chrysanthemum varieties growing outdoors at a greenhouse establishment in Esquimalt, B.C.

Trace to Slight	Moderate	Severe	No Rust
Arlora	Ruth Scott	Charles Ferris	Dark Calumet
Huntsman	Wendy	Bronze Disbud	Petrissian Mauve
Gloria	White Columbus	Ellen Roberts	Film
Superlative	Yellow Columbus	Alabaster	Bronze Giant
Hoy Pink	"Red Yale	Bridesmaid	Bright Eye Pompom
	Harold Park	Wendy	Remember Me
	Hilite		O.K. Calumet
	John Furst		Barbara
	Advent		Mobility
	Film Star		
	Superlative		

NEWS

Dr. Prabhas Kumar Basu, a native of Mymensing, India (now Pakistan) has joined the staff of the Plant Pathology Section, Plant Research Institute, Ottawa. Dr. Basu is a graduate of Presidency College, Calcutta, and is a recent recipient of the Ph.D. degree from the University of Toronto where he worked with Dr. D.L. Bailey on the Verticillium disease of strawberries.

Dr. William Lloyd Seaman has joined the Plant Pathology Section of the Plant Research Institute. Dr. Seaman is a native of Charlottetown, P.E.I. After graduation from McGill University in 1956 he proceeded to the degree of Ph.D. at the University of Wisconsin under Dr. J.C. Walker. His research at Wisconsin was in the field of variability in pathogenicity of *Plasmodiophora brassicae*.

Dr. Donald Davis McLain Jr. is now employed in the Taxonomy and Mycology Section, Plant Research Institute. Dr. McLain holds the B.S., M.S. and Ph.D. degrees from the University of Illinois where he worked, under the direction of Dr. Donald P. Rogers, on the cytology and taxonomy of the Ustilaginales, specifically *Ustilago commelinae*.

Dr. William Laurance Gordon has been appointed Head, Plant Pathology Section, Canada Agriculture Research Station, Winnipeg, Man. He succeeds Dr. W.E. Sackston who recently resigned.

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[1] Plant Pathologists, Experimental Farm, Canada Department of Agriculture,

Dr. Zenon A. Patrick, Plant Pathology Section, Canada Agriculture Research Station, Harrow, Ontario, has been granted a post-doctoral transfer of work to the University of California at Berkeley. During his year's absence from Harrow he will work in Dr. W.C. Snyder's laboratory and will continue his research on root rots with special emphasis on soil toxins.

Mr. Amos Dinoor arrived from Israel in September to spend ten months at the Canada Agriculture Research Station, Winnipeg, Man. While at Winnipeg he will spend part of his time taking courses in Plant Pathology at the University of Manitoba.

Dr. Hubert Martin, Director, Pesticide Research Institute, London, Ontario retired on 30 September after ten years with the Department. Dr. Martin is one of the world's leading authorities on crop protection by the means of chemicals. He is widely known as the author of the book "The Scientific Principles of Plant Protection" which has appeared in four editions.

Dr. John Frederick Dewitt Hockey, Head, Plant Pathology Section, Canada Agriculture Research Station, Kentville, N.S. retired on 18 November after 40 years service with the Department. During his professional career Dr. Hockey's research has been principally in the field of fruit diseases and their control. His contributions to the success of the apple industry were recognized in 1953 by Acadia University with the conferring of the degree of D.Sc. (honoris causa). He will continue to be active in the field of plant pathology and, with a grant from the Nova Scotia Research Foundation, will investigate the diseases of native blueberries.

Richard Rankin Hurst, Head, Plant Pathology Section and Administrative Officer-in-Charge, Research Laboratory, Canada Department of Agriculture Charlottetown, P.E.I. retired on 31 October after 39 years service with the Department. Mr. Hurst, during his career, has been chiefly concerned with diseases of potatoes. He was also one of the original investigators into the role of boron in turnip nutrition.

C.H. Godwin, District Inspector for New Brunswick for the potato seed certification service, Production and Marketing Branch, Canada Department of Agriculture, retired 18 October after 39 years service with the Department. Mr. Godwin joined the Department in 1921 after graduation from Ontario Agricultural College at Guelph, Ontario.

Dr. Ralph Anthony Ludwig, Director, Canada Agriculture Research Station, Kentville, N.S. has been appointed Director, Plant Research Institute, Research Branch, Canada Department of Agriculture, Ottawa, Ont. Dr. Ludwig will assume his new duties early in the new year.

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